Kurdistan Regional Government - Iraq
Ministry of Education - Directorate General of Curricula and Printables

SCIENCE 3

Grade Three

Student Book

Book Content

UNIT 1 Life Science 7

Chapter 1 Diversity of Living Things 10

Chapter 2 Where Living Things Are Found 38

Chapter 3 Living Things Depend on One Another 64

Activities for Home or School 80

UNIT 2 Earth Science 81

Chapter 1 Minerals and Rocks 84

Chapter 2 Water 102

Chapter 2 The Movement of Objects in the Solar System 122

Activities for Home or School 140

UNIT 3 Physical Science 141

Chapter 1 Properties and Changes of Matter 144

Chapter 2 Heat 166

Chapter 3 Forces and Motion 182

Activities for Home or School 200

Health 201

Glossary 209

UNIT 1 LIFE SCIENCE

Unit Experiment 9

CHAPTER 1 **Diversity of Living Things** 10

Lesson 1 What Are Kinds of Plants? 12

Lesson 2 What Are Mammals and Birds? 20

Lesson 3 What Are Amphibians, Fish and Reptiles? 28

Chapter Review and Test Preparation 36

CHAPTER 2 **Where Living Things Are Found** 38

Lesson 1 What Is a Desert Environment? 40

Lesson 2 What Is a Mountain Environment? 46

Lesson 3 What Are Water Ecosystems? 54

Chapter Review and Test Preparation 62

CHAPTER 3 **Living Things Depend on One Another** 64

Lesson 1 How Do Living Things Get Food? 66

Lesson 2 What Are Food Chains? 72

Chapter Review and Test Preparation 78

Activities for Home or School 80

UNIT 2 EARTH SCIENCE

Unit Experiment 83

CHAPTER 1 **Minerals and Rocks** 84

Lesson 1 What Are Minerals and Rocks? 86

Lesson 2 How Do Rocks Form? 92

Chapter Review and Test Preparation 100

CHAPTER 2 **Water** 102

Lesson 1 Where is water found on Earth? 104

Lesson 2 What Is the Water Cycle? 114

Chapter Review and Test Preparation 120

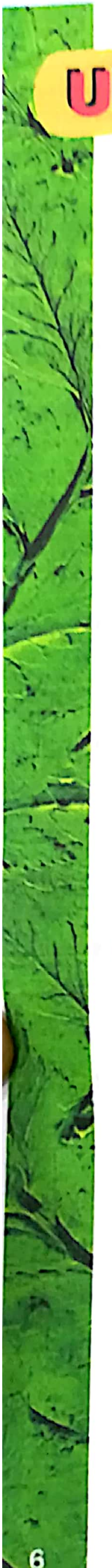
CHAPTER 3 **The Movement of Objects in the Solar System** 122

Lesson 1 What Are Stars and Planets? 124

Lesson 2 What Results When the Moon and Earth Move? 130

Chapter Review and Test Preparation 138

Activities for Home or School 140



UNIT 3 PHYSICAL SCIENCE

Unit Experiment 143

CHAPTER 1 **Properties and Changes of Matter** 144
Lesson 1 What Are Properties of Matter? 146
Lesson 2 How Does Matter Change? 156
Chapter Review and Test Preparation 164

CHAPTER 2 **Heat** 166
Lesson 1 What Is Heat? 168
Lesson 2 How Does Heat Move? 174
Chapter Review and Test Preparation 180

CHAPTER 3 **Forces and Motion** 182
Lesson 1 How Do Forces Cause Motion? 184
Lesson 2 What Are Simple Machines? 192
Chapter Review and Test Preparation 198

Activities for Home or School 200

Life Science

UNIT 1 LIFE SCIENCE

CHAPTER 1 Diversity of Living Things 10

CHAPTER 2 Where Living Things Are Found 38

CHAPTER 3 Living Things Depend on One Another . . . 64

Activities for Home or School. 80

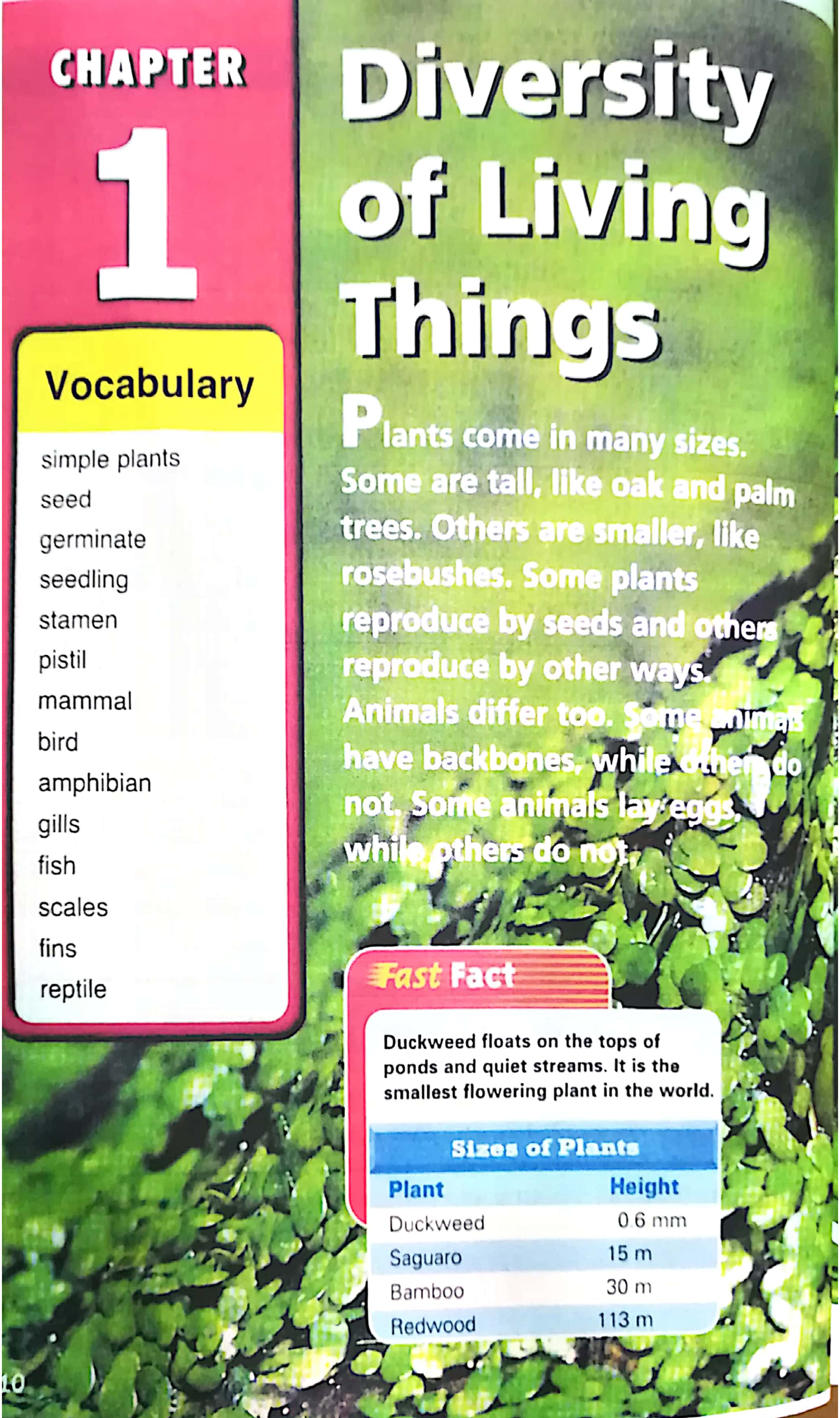
UNIT EXPERIMENT

Liquids and Plant Growth

Plants need water to grow and stay healthy. As you study this unit, you can conduct a long-term experiment to find out how other liquids affect plant growth. Here are some questions to think about. Will plants grow if they are given liquids other than water? Will plants grow if other liquids are mixed with water? Plan and conduct an experiment to find answers to these questions.

CHAPTER 1

Diversity of Living Things



Vocabulary

- simple plants
- seed
- germinate
- seedling
- stamen
- pistil
- mammal
- bird
- amphibian
- gills
- fish
- scales
- fins
- reptile

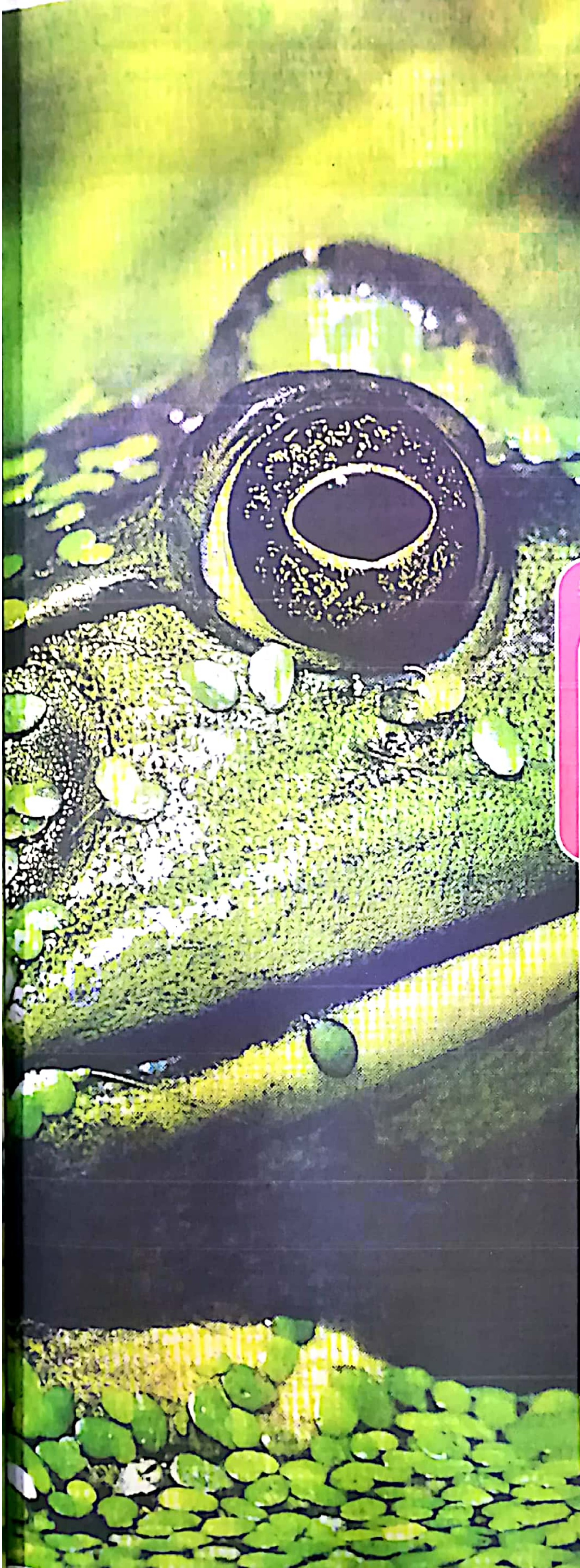
Plants come in many sizes. Some are tall, like oak and palm trees. Others are smaller, like rosebushes. Some plants reproduce by seeds and others reproduce by other ways. Animals differ too. Some animals have backbones, while others do not. Some animals lay eggs, while others do not.

Fast Fact

Duckweed floats on the tops of ponds and quiet streams. It is the smallest flowering plant in the world.

Sizes of Plants

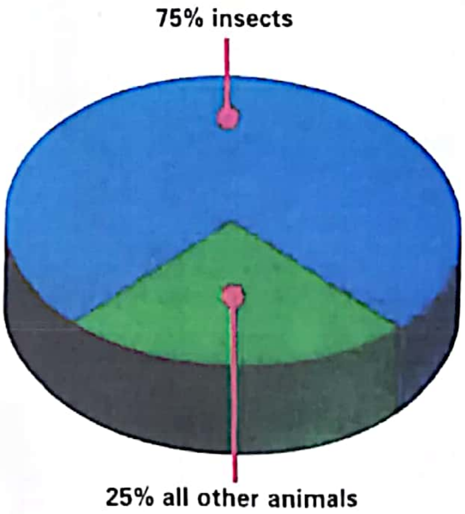
Plant	Height
Duckweed	0.6 mm
Saguaro	15 m
Bamboo	30 m
Redwood	113 m



Frog in duckweed

Fast Fact

Types of Animals on Earth



Did you know that 75 out of every 100 types of animals in the world are insects?

LESSON 1

What Are Kinds of Plants?

In this lesson, you can . . .

INVESTIGATE what seeds need to sprout.

LEARN ABOUT kinds of plants.

LINK SCIENCE to math and social studies.

INVESTIGATE

Sprouting Seeds

Activity Purpose Cucumbers, carrots, and apples come from very different kinds of plants. But as different as these plants are, they all started as seeds. In this investigation, you will **observe** seeds to find out what they need to grow into new plants.

Materials

- 3 kinds of seeds
- paper towels
- 3 small zip-top bags
- scissors
- water
- tape
- hand lens

Activity Procedure

1. Start with a small amount of mixed seeds. Use size and shape to sort the seeds into three groups.
2. Cut two paper towels in half. Fold the towels to fit into the plastic bags. (Picture A) Add a little water to make the towels damp.

These corn seedlings have roots, stems, and leaves.

Seeds	Days				
	1	2	3	4	5
Group 1					
Group 2					
Group 3					

Picture A

Picture B

3. Put one group of seeds into each bag, and seal the bags. Label the bags *1*, *2*, and *3*. Tape the bags to the inside of a window.

4. Use a hand lens to **observe** the seeds every school day for 10 days. (Picture B) Use a chart like the one shown to **record** your observations.

Draw Conclusions

1. What changes did you **observe** in the seeds?
2. How quickly did the changes take place in the different kinds of seeds?
3. **Scientists at Work** Scientists **observe** their investigations closely to get new information. How did observing the seeds help you understand more about seeds?

Process Skill Tip

When you **observe**, you use your senses to gather information. Observing seeds as they grow will help you understand more about plants.

LEARN ABOUT

Kinds of Plants

FIND OUT

- kinds of plants
- how plants reproduce
- what seeds need to germinate and grow

VOCABULARY

simple plants
seed
germinate
seedling
stamen
pistil

Plants That Produce Spores

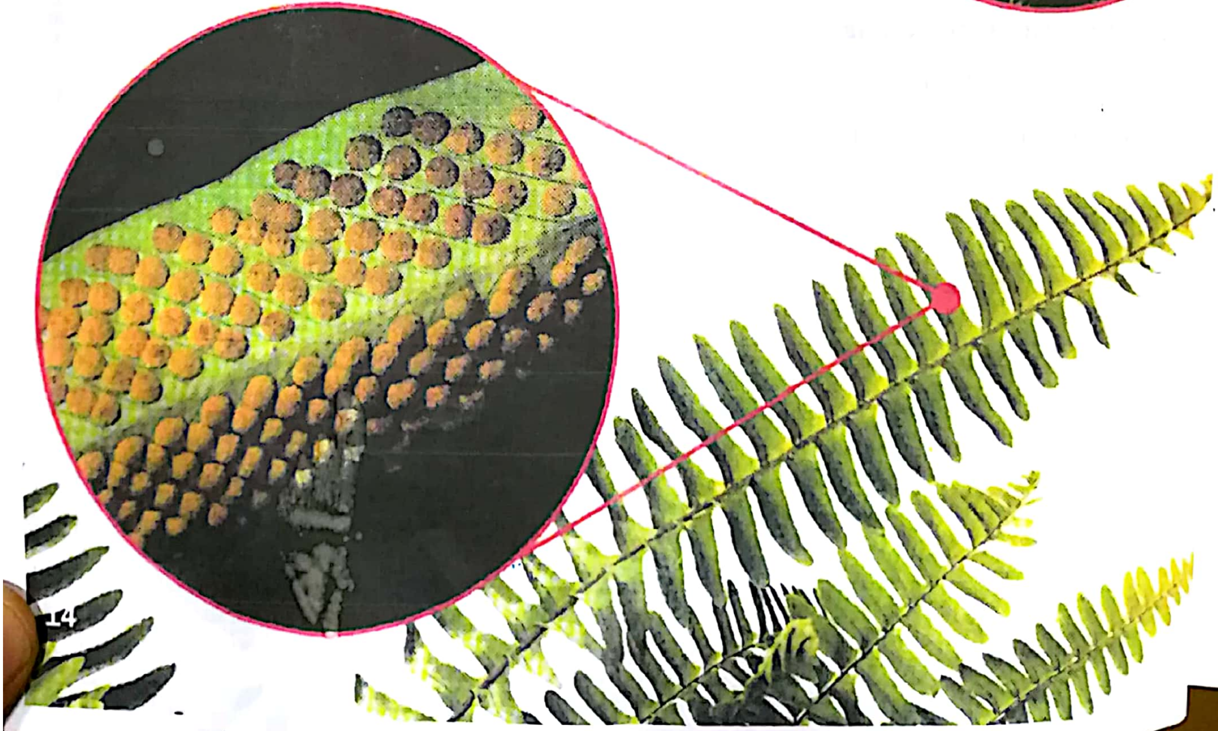
Simple plants such as mosses have no roots, stems, or leaves. Simple plants do not have tubes to move water through their parts. They reproduce by spores.

Ferns have roots, stems, and leaves. Ferns, like simpler plants, reproduce by spores. These spores are found on the underside of the fern leaves, or fronds.

✓ **What are simple plants?**

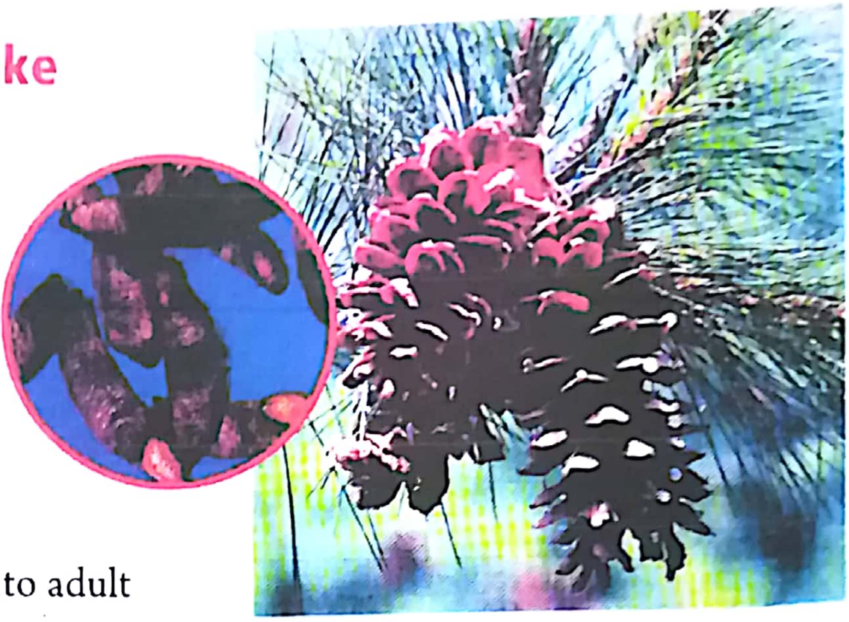
This is a funaria moss. The parts that look like roots, stems, and leaves help the plant meet its needs. Like all other plants, simple plants need water, light, soil, and air to live. ▶

Plants, such as this fern, reproduce by spores. The spores shown in the magnified photo are in small dots. ▼



Some Plants That Make Seeds

The **seed** is the first stage of growth in many plants that have roots, stems, and leaves. Plants that reproduce by seeds usually form more than one seed at a time. These seeds carry the information needed to grow into adult plants.



▲ Pine leaves and cones.

Two groups of plants form seeds: The flowering plants, which include all bushes, trees, and small plants that have flowers, and the plants that have cones, such as pine trees.

✓ **Name five plants that form seeds.**

▼ The seeds of apples and watermelons are protected by their fruits.

▼ Dandelions form many seeds that are easily blown by the wind.

Seed Germination

In the investigation, you observed that seeds began to grow into new plants when you gave them water and warmth. When the small plant breaks out of the seed, we say the seed **germinates**.

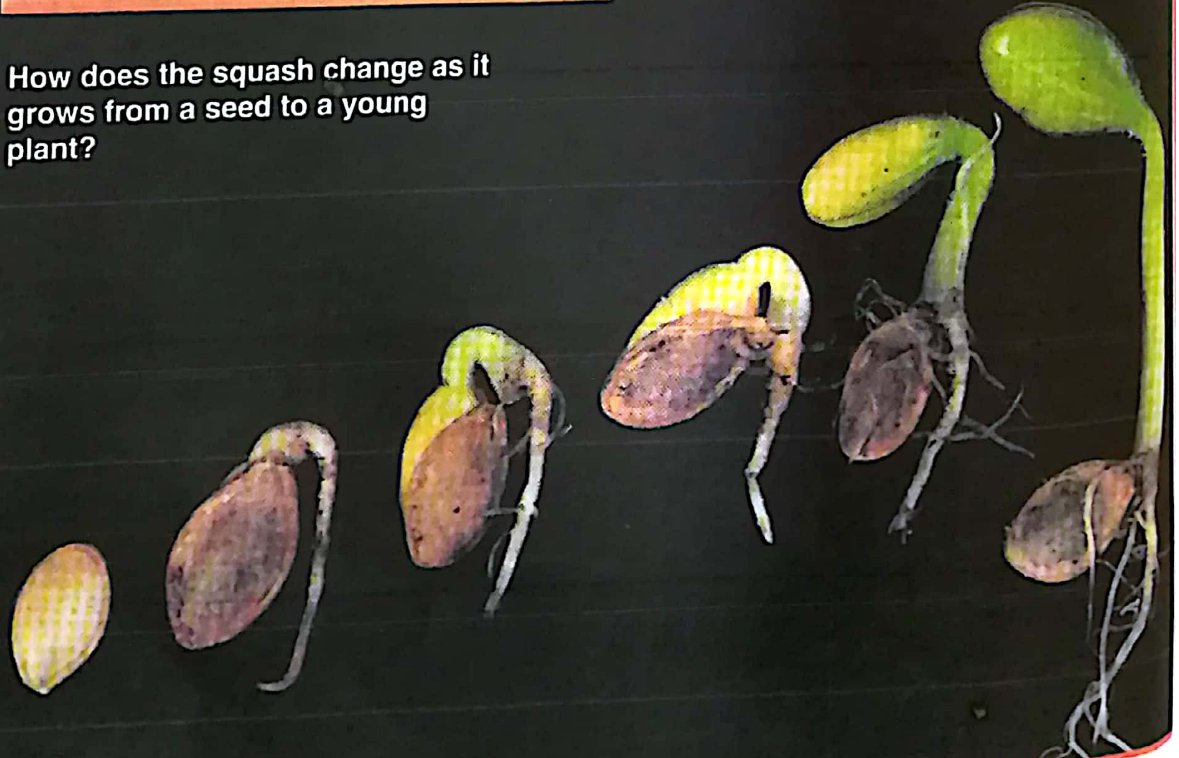
As a seed begins to sprout, a root grows from it. Next, the seed breaks open and a young plant, or **seedling**, appears. The roots and the stem grow longer. Soon the seedling breaks through the soil and more leaves begin to form.

✓ **What do seeds need to grow?**

This squash is ready to be eaten. Its fruit is filled with seeds that could grow into new plants. ▼

The phases of germination in the squash seed

How does the squash change as it grows from a seed to a young plant?

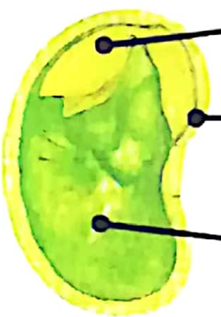


Seed Parts

Seeds may be many different shapes, sizes, and colors. But all seeds have the same parts. The seed is wrapped by the seed coat. Inside the seed coat is a seedling and food for the seedling.

✓ **What are the parts of a seed?**

The Parts of a Seed



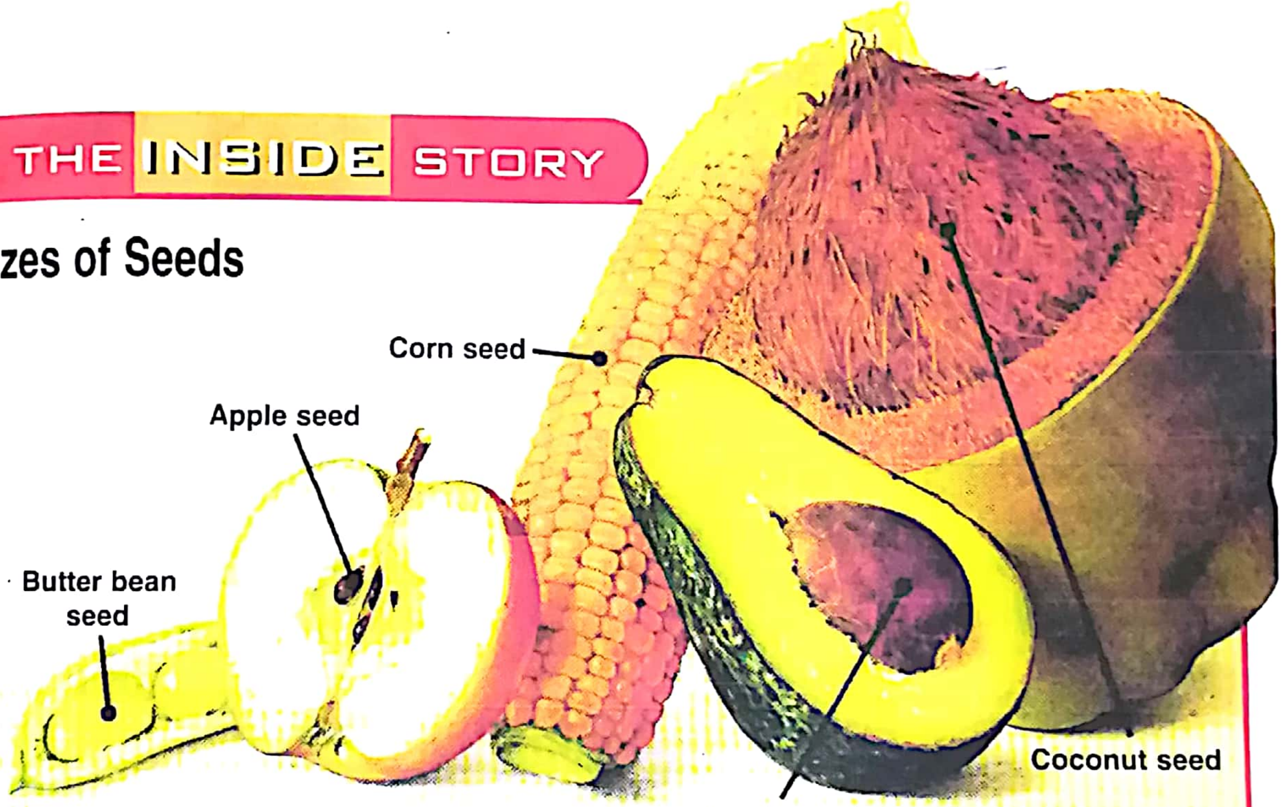
Seedling: A seedling lives inside every seed.

Seed coat: The seed coat protects the young plant inside the seed.

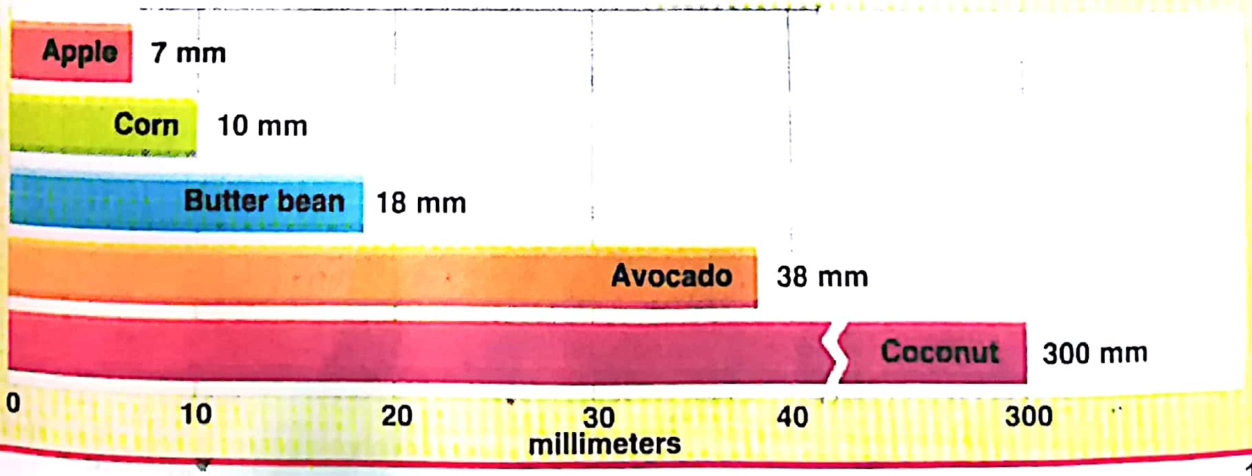
Stored Food: Most of the inside of a seed is stored food. The young plant uses the food to grow when the seed sprouts.

THE INSIDE STORY

Sizes of Seeds



Seed Lengths

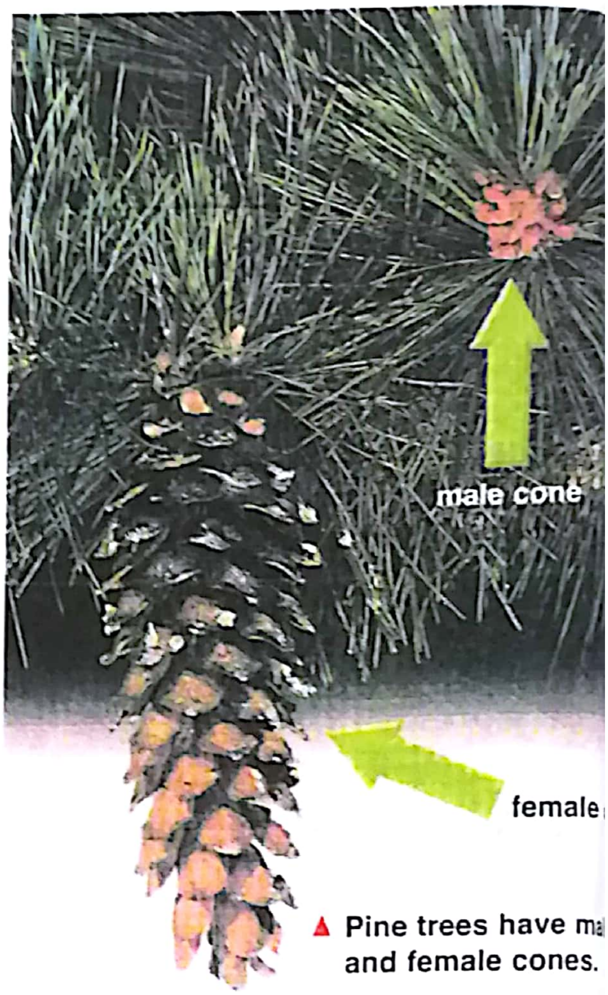


Where Seeds Form?

Seeds form in flowers. Look at the diagram of the flower below. The male part of the flower is called the **stamen.** The female part of the flower is called the **pistil.** Seeds form in the bottom part of the pistil. As the seeds grow, the bottom part of the pistil swells around them to form a fruit.

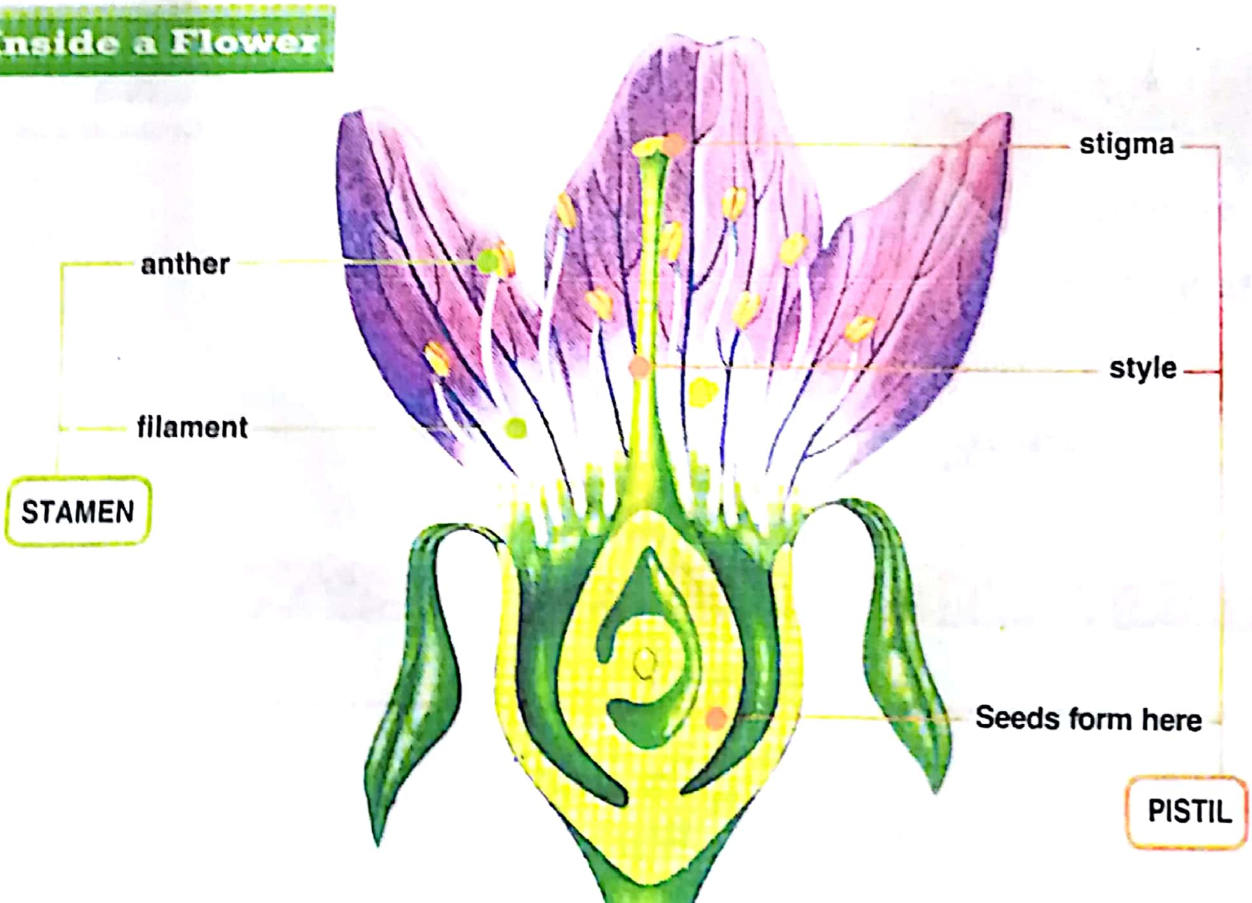
Seeds also form in cones. Have you ever looked closely at a pine tree? If you have, you may have noticed that it has two kinds of cones. The small cone is male and the large cone is female. The seeds form inside the female cone. The cone opens and the seeds fall out.

✓ **Where do seeds form?**



▲ Pine trees have ma
and female cones.

Inside a Flower



▲ Witch hazel plants shoot their seeds to spread them.

Summary

Simple plants reproduce by spores. Some plants form seeds to make new plants. Seeds grow to look like the adult plants they came from. Although they may look different from one another, all seeds have the same parts and need water and warmth to sprout.

Review

1. What is a seedling?
2. What are some ways plants make new plants?
3. What plants form seeds?
4. When two seeds are similar, does this mean that they will grow into similar plants? Explain?
5. **Test Prep** What happens when a seed germinates?
   - **A** The seed breaks open and a seedling appears.
   - **B** The seedling breaks through the soil.
   - **C** Leaves begin to form.
   - **D** A root grows from the seed.

LINKS

MATH LINK

Solve a Problem

Working with a partner, cut open an apple. Count the seeds inside. How many seeds in the whole class? Group the seeds by tens.

Note: The whole class should participate. Each pair of students must work on cutting open an apple.

SOCIAL STUDIES LINK

Seeds Are Food

Research the kinds of seeds people eat. Share what you learn with your classmates .

LESSON 2

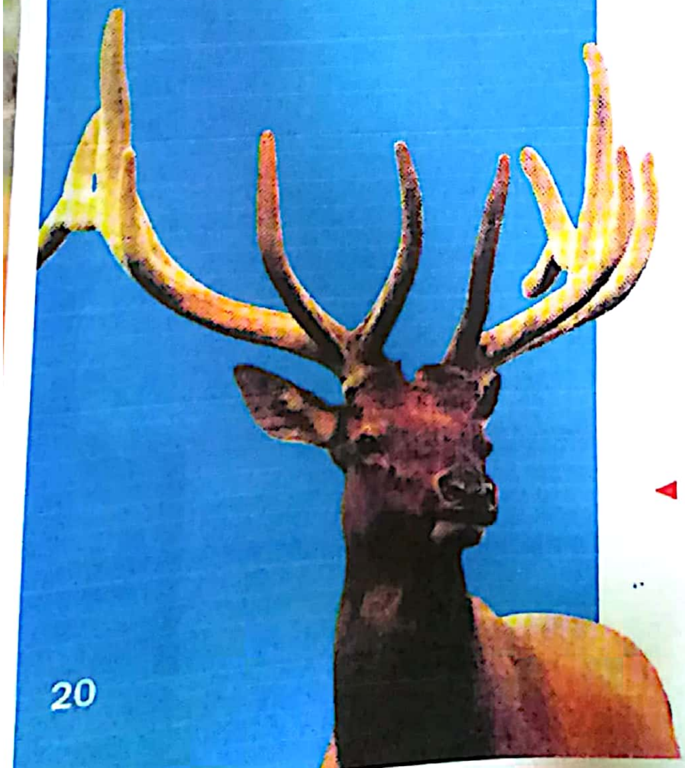
What Are Mammals and Birds?

In this lesson, you can . . .

INVESTIGATE how fur helps animals.

LEARN ABOUT the traits of mammals and birds.

LINK SCIENCE to math and fine arts.



The fur on this elk keeps him warm all through the winter.

INVESTIGATE

Fur Helps Animals

Activity Purpose When it's cold outside, you might put on a jacket or a sweater to keep warm. Animals can't do that. In this investigation you will **use a model** to find out how fur helps keep animals warm.

Materials

- glue
- 2 metal cans
- cotton batting
- hot water
- 2 thermometers
- classroom clock

CAUTION

Activity Procedure

1. Make a chart like the one shown on the next page.
2. Spread glue around the outside of one can. Then put a thick layer of cotton around the can. Wait for the glue to dry. Then use your fingers to fluff the cotton. (Picture A)

Time	Water Temperature in Can with Cotton	Water Temperature in Can without Cotton
Start		
10 min		
20 min		
30 min		

3. **CAUTION** **Be careful with the hot water. It can burn you.** Your teacher will fill both cans with hot water.

4. Place a thermometer in each can, and **record** the temperature of the water. (Picture B)

5. Check the temperature of the water in each can every 10 minutes for a period of 30 minutes. **Record** the temperatures on the chart.

Picture A

Picture B

Draw Conclusions

1. In which can did the water stay hot longer? Why?
2. How is having fur like wearing a jacket?
3. **Scientists at Work** Scientists often **use a model** to study things they can't observe easily. In this investigation, you made a model of an animal with fur. Why was using a model easier than observing an animal?

Process Skill Tip

It would be hard to measure the temperature of a real animal to find out how fur helps it stay warm. **Using a model** helps you learn about animal fur.

LEARN ABOUT

Mammals and Birds

FIND OUT
- four traits of mammals
- five traits of birds

VOCABULARY

mammal
bird

Mammals

In the investigation you learned that fur can help an animal stay warm. Animals that have fur or hair are called **mammals**. Horses, cows, goats, and deer are all mammals.

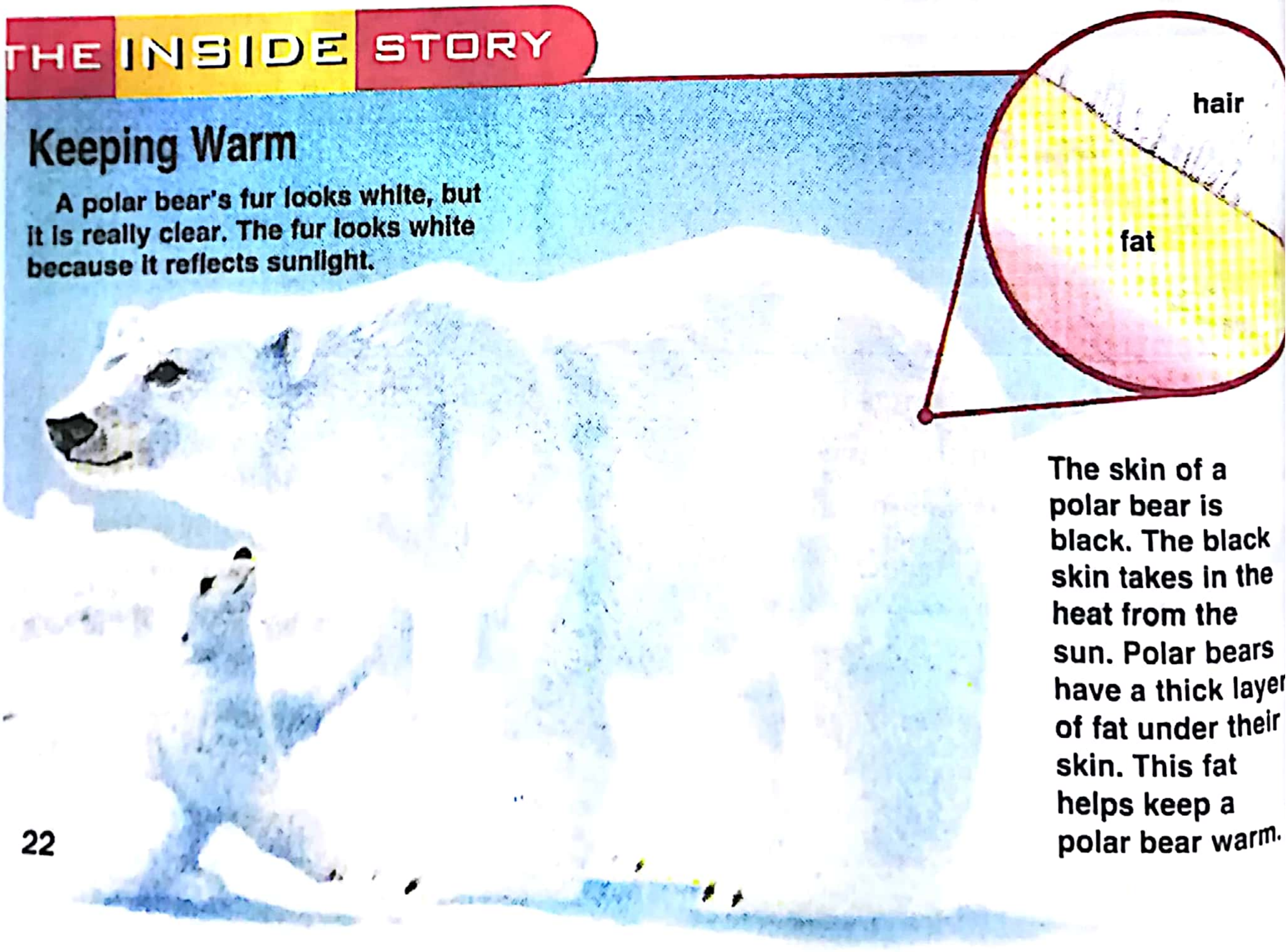
Mammals use lungs to breathe. Mammals that live in water, such as whales, come to the surface of the water to breathe the air they need.

Most mammals give birth to live young. Before the kittens are born, the mother cat carries them inside her.

THE INSIDE STORY

Keeping Warm

A polar bear's fur looks white, but it is really clear. The fur looks white because it reflects sunlight.



The skin of a polar bear is black. The black skin takes in the heat from the sun. Polar bears have a thick layer of fat under their skin. This fat helps keep a polar bear warm.

After the kittens are born, they feed on milk made by their mother's body.

When a mammal is born, it cannot care for itself. It must be sheltered and fed by its mother. The milk gives it what it needs to grow and stay healthy.

Most mammals learn from their parents how to care for themselves and find food. In time a young mammal learns what it needs to know to live on its own.

✓ **What are four traits mammals inherit from their parents?**

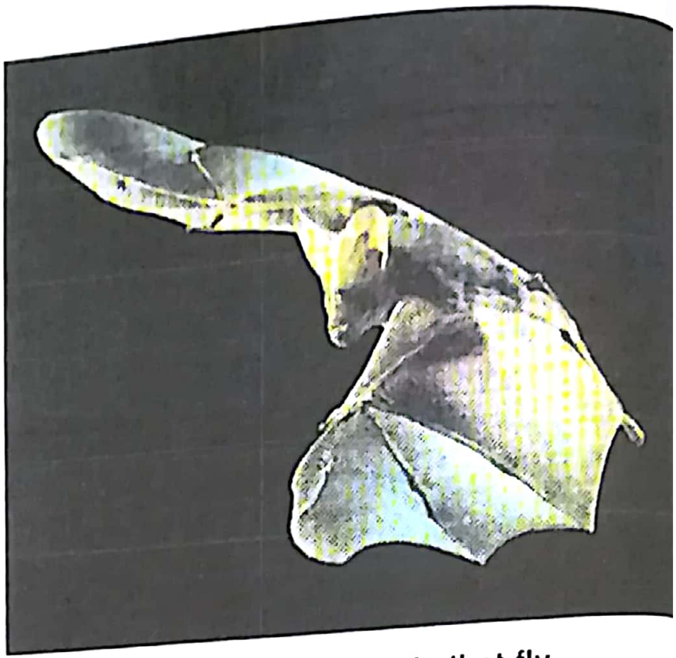
▲ These puppies drink milk from their mother to get the food they need.

▼ Gorillas often live in large families. All the adults help care for the young.

Types of Mammals

There are many types of mammals. Most of them have the four traits you read about. Some also have other traits, such as trunks, pouches, or wings. Mammals are often placed into groups based on traits they share. Some of these groups and their traits are shown on this page.

✓ **Name three traits used to place mammals in groups.**

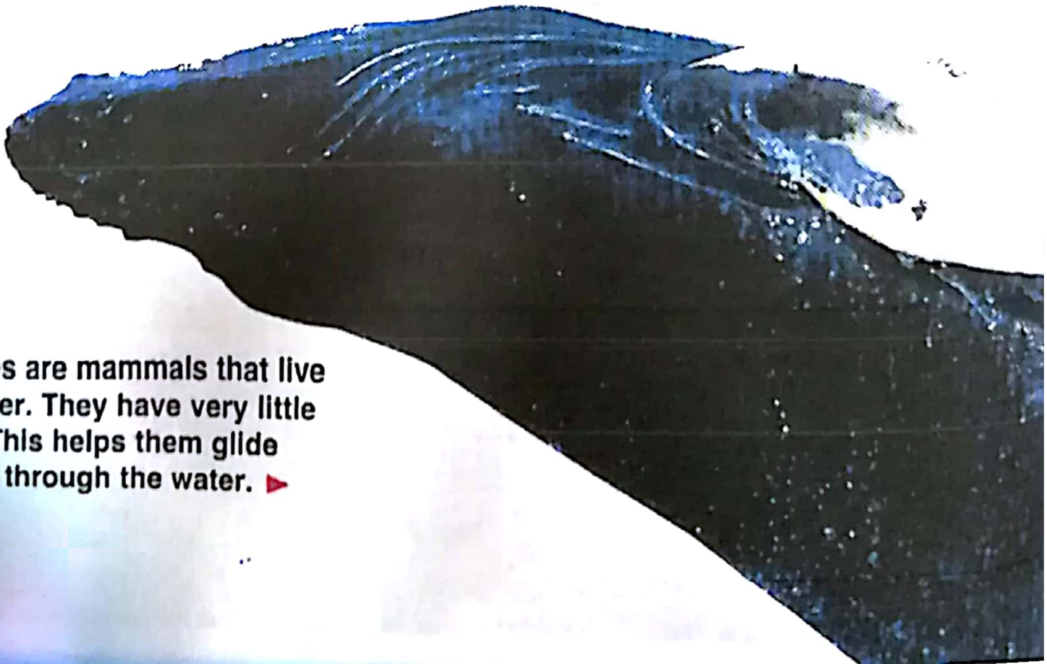


▲ Bats are the only mammals that fly.

▼ This orangutan and other apes are mammals that can use their hands to grasp objects.

▲ This spiny echidna, an anteater, is a mammal, but it does not give birth to live young. It lays eggs.

▼ A koala is one of a few mammals that carry their young in a pouch.



Whales are mammals that live in water. They have very little hair. This helps them glide easily through the water. ►

Birds

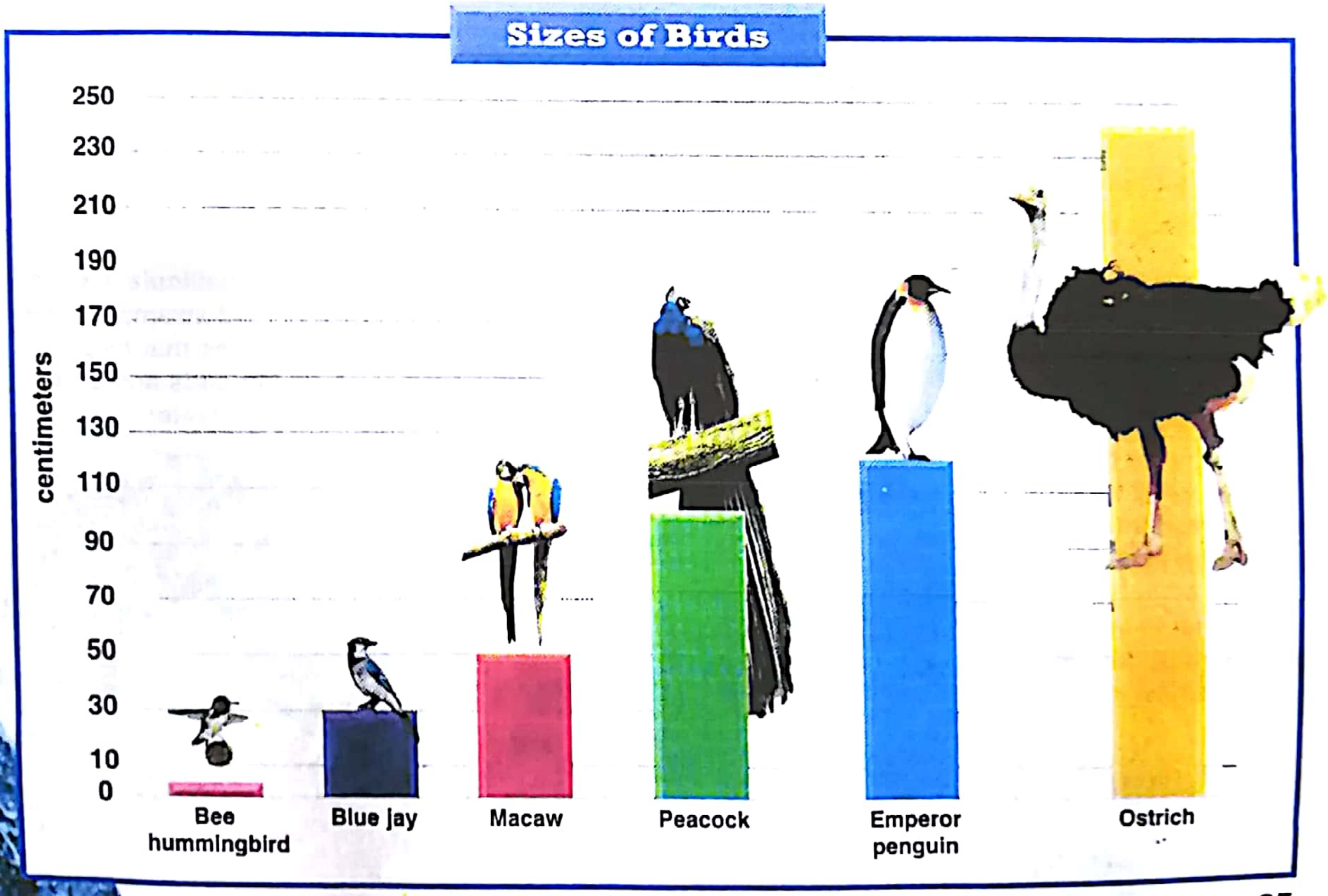
Birds are animals that have feathers, two legs, and wings. Most birds use their wings for flying. Some birds, such as penguins, cannot fly.

Like mammals, birds have lungs for breathing air. Unlike most young mammals, young birds hatch from eggs.

Feathers cover most of a bird's body. But not all feathers are the same. Some feathers help keep a bird warm. The wing feathers of many birds have a shape that helps them fly.

✓ **What are five traits of birds?**

▲ A weaverbird uses leaves and grass to make a hanging nest. The mother bird lays her eggs on soft grass placed inside the nest.



Types of Birds

Birds are grouped together because of traits they share. The most common traits used for grouping birds are beak shape and foot shape.

Beak shape can be used to tell what kind of food a bird eats. For example, some birds have long beaks that help them catch fish and dig small animals from the mud.

Foot shape can be used to tell where a bird lives. For example, wading birds have long toes that keep them from sinking into the mud. For some birds foot shape is also important in getting food.

✓ **What can you tell about a bird from the shape of its beak or feet?**

▲ The feet of a falcon are useful for catching animals that it hunts.

A quail uses its beak to eat seeds. ►

▼ The purple gallinule lives in marshes and swamps. It has long, thin toes that help it walk on lily pads and other plants in the water.

The great blue heron is a wading bird. Its beak has a shape that is useful for catching fish. ►

Summary

Mammals are animals that have fur or hair and breathe with lungs. Most mammals also give birth to live young and feed their young with milk from the mother's body. Birds are animals that have feathers, two legs, and wings. Like mammals, birds breathe with lungs. Unlike most mammals, birds lay eggs from which their young are hatched.

Review

1. Name a mammal that lives in the water. How does it breathe?
2. How does the spiny echidna differ from most other mammals?
3. What two features of birds are most often used to classify them? Why?
4. The bat can fly although it is a mammal. What traits make the bat a mammal and not a bird?
5. **Test Prep** Which trait is shared by birds and mammals?
   - A have feathers
   - B have fur
   - C breathe with lungs
   - D give birth to live young

LINKS

MATH LINK

Interpret Graphs
Look at the graph on page 25. Which birds have the longest tails? If the length of the tails were added to the length of the bodies in the graph, which bird would be the longest?

FINE ARTS LINK

Animal Footprints
You can distinguish many animals from their footprints. Make a poster of the footprints of different animals. Write the name of the animal below its footprint.

LESSON 3

What Are Amphibians, Fish, and Reptiles?

In this lesson, you can . . .

- **INVESTIGATE** how frogs change as they grow.
- **LEARN ABOUT** amphibians, fish, and reptiles.
- **LINK SCIENCE** to math and writing.

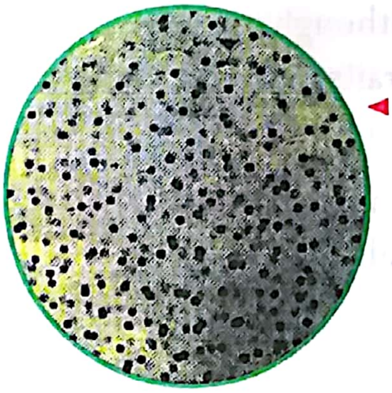
INVESTIGATE

From Egg to Frog

Activity Purpose Frogs lay eggs in the water. When a young frog hatches, it can live only in water. But as the young frog grows, its body changes. The changes get it ready to live on land. In this investigation you will **observe** these changes in real frogs.

Materials

- gravel
- aquarium
- water
- ruler
- water plants
- rock
- tadpoles
- dried fish food



◀ These frog eggs were laid underwater. They will hatch into tadpoles.

◀ Unlike frogs you may know about, this red-eyed tree frog makes its home in trees.

Activity Procedure

Picture A

1. Put a layer of gravel on the bottom of the aquarium. Add 12 cm to 15 cm of water.
2. Float some water plants on top of the water, and stick others into the gravel. Add the rock. It should be big enough so that frogs can sit on it later and be out of the water. (Picture A)
3. Put two or three tadpoles, or young frogs, in the water. Put the aquarium where there is some light but no direct sunlight.
4. Feed the tadpoles a small amount of dried fish food once a day. Add fresh water to the aquarium once a week.
5. **Observe** the tadpoles every day. Once a week, make a drawing of what they look like.

Draw Conclusions

1. What changes did you see as the tadpoles grew?
2. When the tadpoles began to climb out of the water, what did their bodies look like?
3. **Scientists at Work** Scientists **record** what they **observe**. How did recording your observations help you learn about the growing tadpoles?

Process Skill Tip

When you **observe**, you will use your senses of sight, hearing, smell, and touch. Then you **record**, or write down, your observations.

LEARN ABOUT

Amphibians, Fish, and Reptiles

FIND OUT

- four traits of amphibians
- five traits of fish
- three traits of reptiles

VOCABULARY

amphibian
gills
fish
scales
fins
reptiles

Amphibians

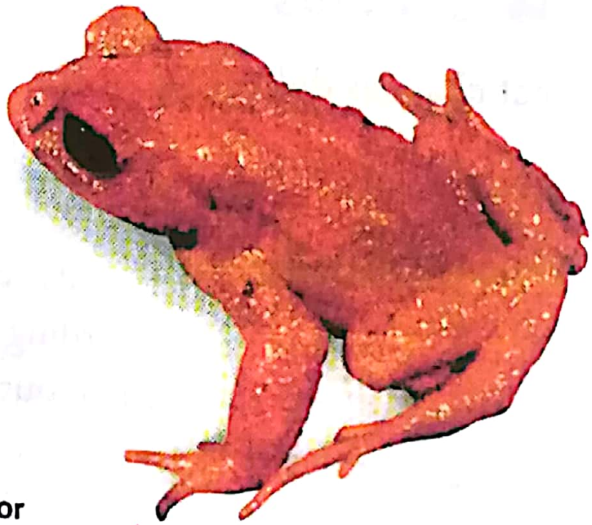
Frogs are amphibians. **Amphibians** are animals that begin life in the water and move onto land as adults.

Amphibians lay eggs in the water. The eggs stay there until they hatch. Young amphibians live in the water, just as tadpoles do. Most adult amphibians live on land.

Amphibians have moist skin. That's why most amphibians stay close to water.

✓ **Name three traits of an amphibian.**

◄ A salamander moves its body from side to side to help its legs move forward.



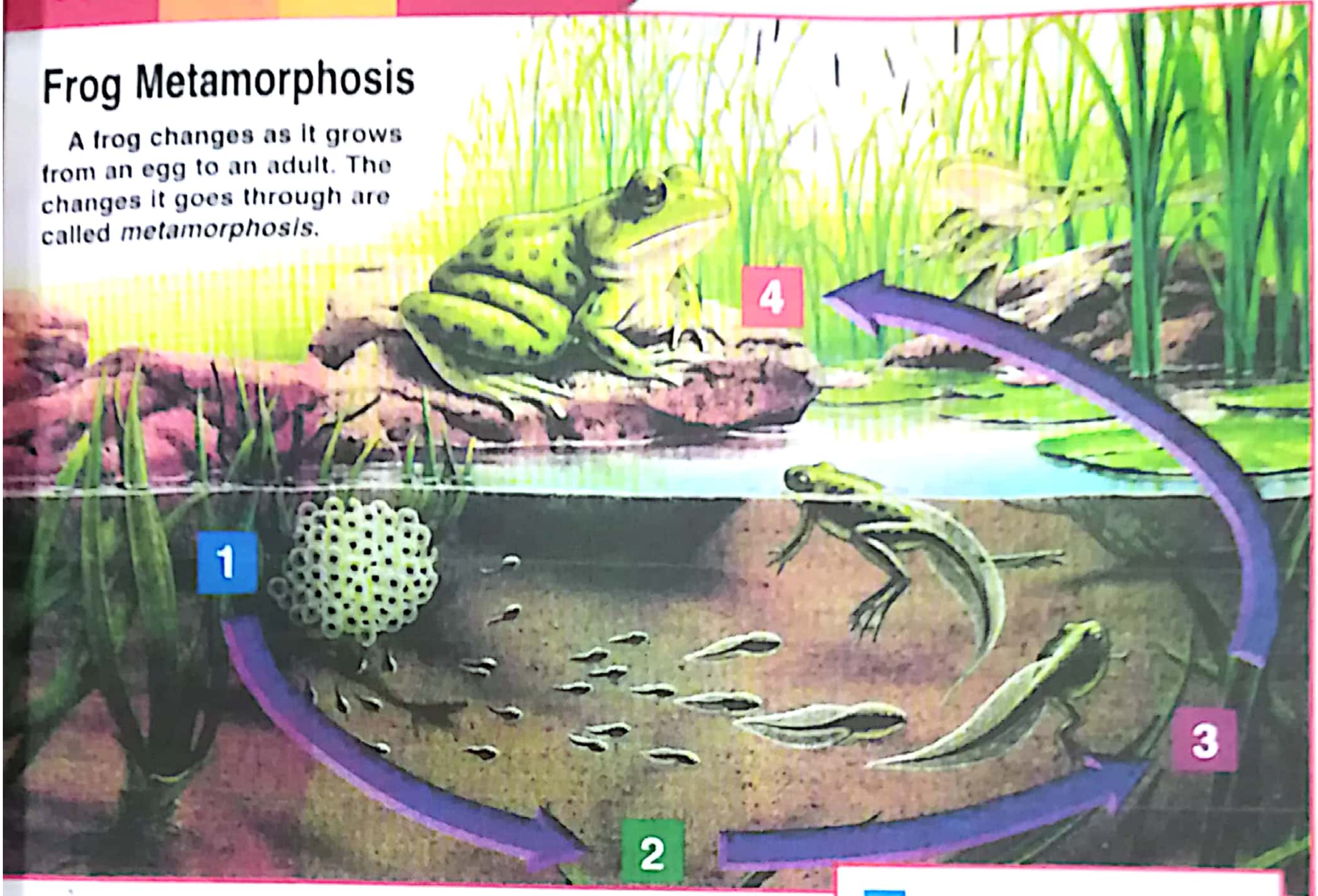
▲ Toads live most of their adult lives on land. Unlike some other amphibians, toads have rough skins.

▼ Newts live in water for part of the year. Then they live on land.

THE INSIDE STORY

Frog Metamorphosis

A frog changes as it grows from an egg to an adult. The changes it goes through are called *metamorphosis*.



1 A frog lays many eggs at one time. The eggs are covered by a jellylike coating.

2 Hatched tadpoles have gills for breathing in water. They also have a tail but no legs.

3 As a tadpole grows, lungs begin to form. Back and front legs begin to grow.

4 Once the lungs work, the gills and the tail disappear. The adult frog is now ready to live on land.

Frogs Grow and Change

As you saw in the investigation, young frogs look very different from adult frogs. Young frogs hatch from eggs and begin life in the water. They breathe with gills. **Gills** are body parts that take in oxygen from the water.

As they grow, young frogs change. In time, they form lungs. Once they have lungs, their gills begin to disappear. Legs grow and the tail disappears. The frog is then ready to live on land.

✓ **What body parts do young frogs have that adult frogs do not have?**

Fish

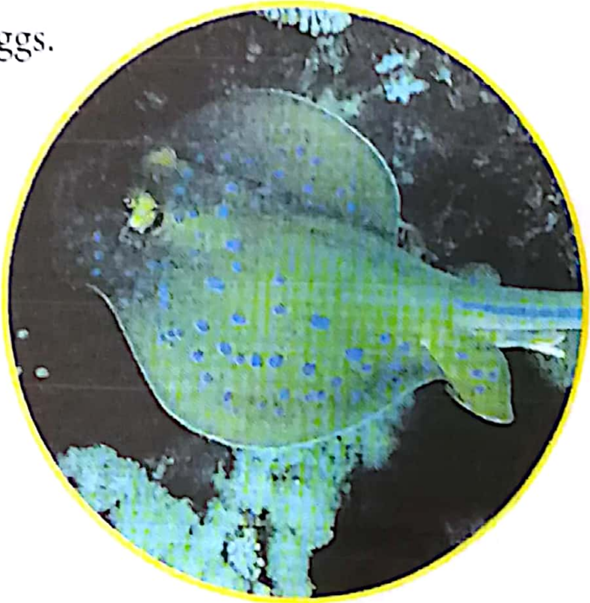
Fish are animals that live their whole lives in water. Fish have gills on the sides of their heads. The gills take in oxygen from the water.

Most fish are covered with scales. **Scales** are small, thin, flat plates that help protect the fish and help them glide through the water.

Fish have fins. **Fins** are the body parts that help fish move in the water in different directions. Most fish lay eggs.

✓ **What are three traits of fish?**

▲ This Guadeloupe bass has a skeleton made of bones.



This ray has a cartilage skeleton just like a shark, but its body is flat. ►

▼ Sharks do not have bones. Instead, their skeletons are made of a softer material called cartilage.

Reptiles

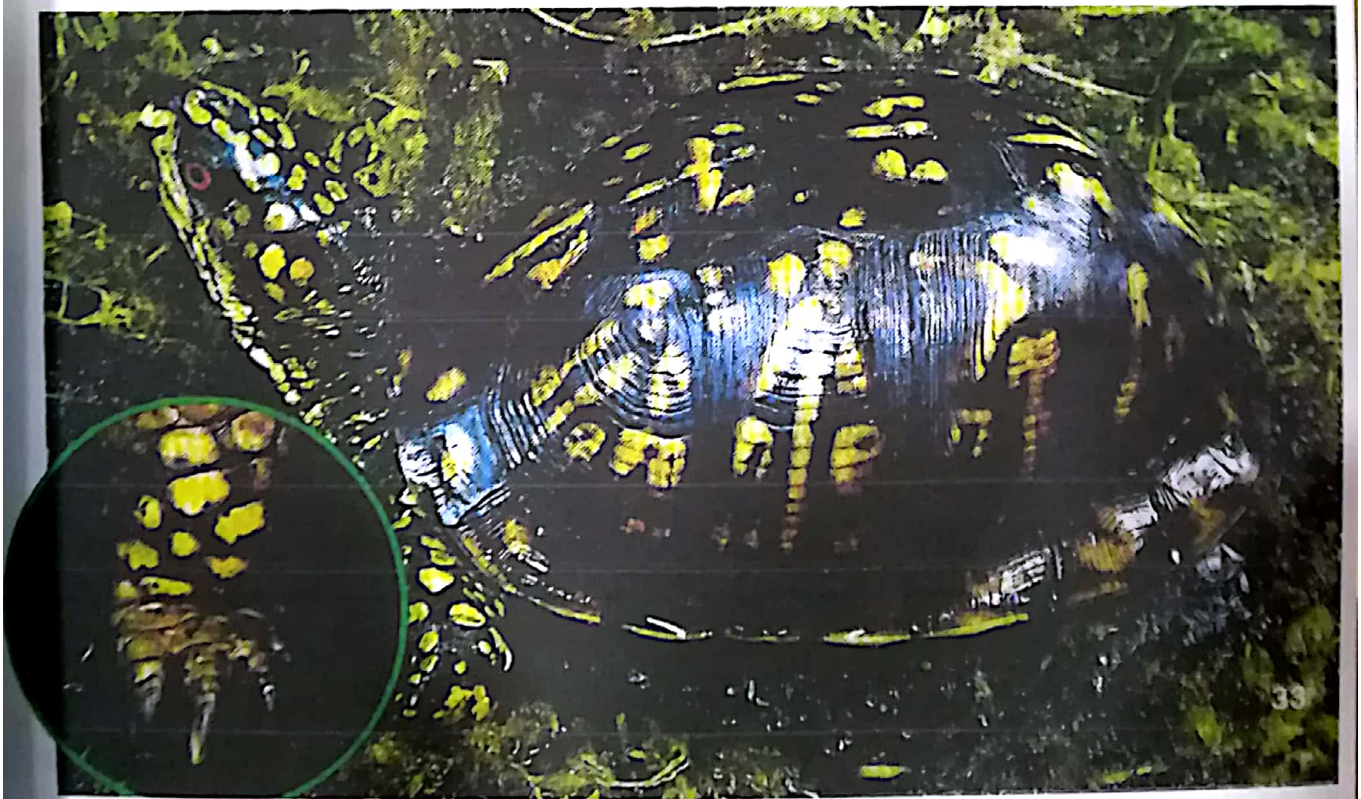
Reptiles are land animals that have dry skin covered by scales. The **scales** are hard plates that protect the reptile's body. Because they live mostly on land, reptiles use lungs to breathe air. The reptiles that spend a lot of time in water must come to the surface to breathe air. A crocodile, for instance, often stays in water. But it stays near the surface so its nose and eyes are above the water. This allows the crocodile to breathe and see.

Many reptiles hatch from eggs laid on land.

✓ **What are three traits of reptiles?**

▲ Sea turtles hatch from eggs laid on land.

▼ The turtle has a hard shell that protects most of its body. The turtle has scales on its body.



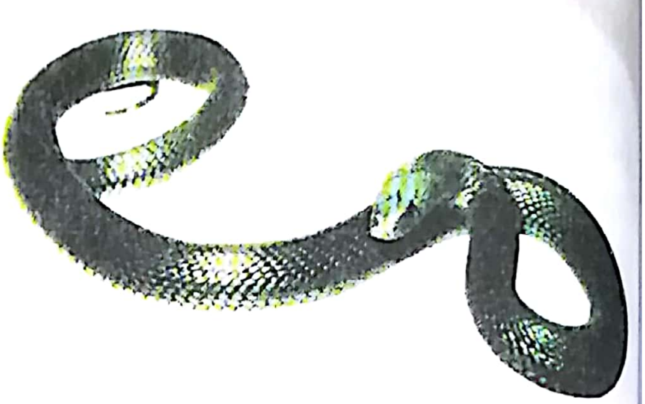
Types of Reptiles

There are three main groups of reptiles. Lizards and snakes are in one group. Their bodies have rows of scales that overlap. Lizards have four legs and long tails. Snakes don't have legs.

Crocodiles are another reptile group. They live in water a lot of the time. They come out of the water to sun themselves.

Tortoises and turtles make up the third group of reptiles. They are the only reptiles that have shells. Tortoises live on land. Turtles live in water.

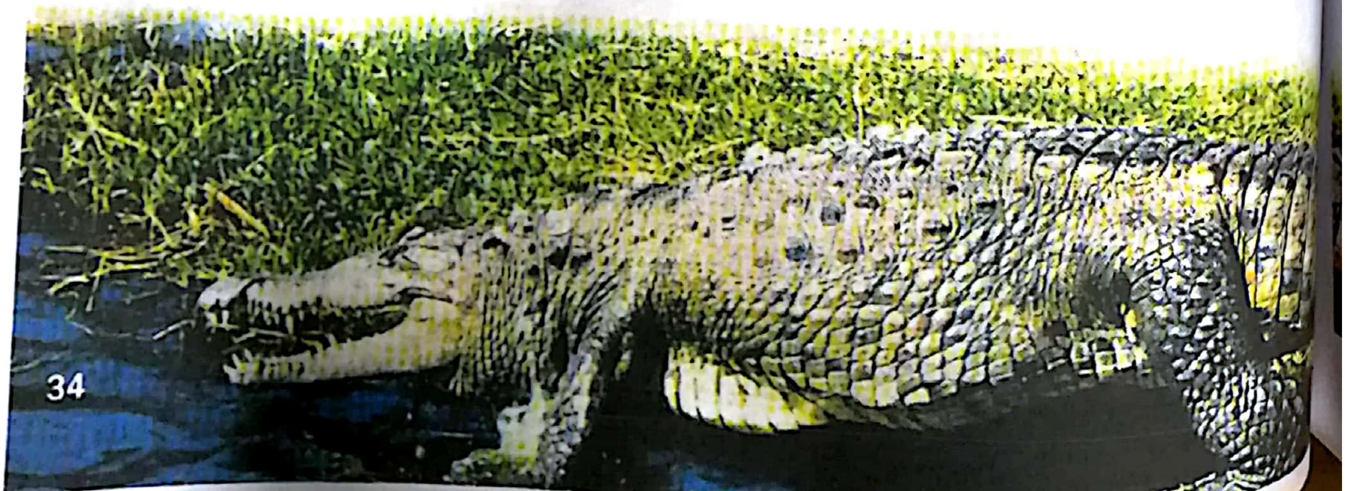
✓ **What are the three groups of reptiles?**



▲ The Egyptian black cobra is a large snake. Like other snakes, it sheds its scaly skin and grows new skin.

▲ The Australian frilled lizard uses a fan-shaped body part to scare away enemies.

▼ A crocodile can lie very still in the water, with only its eyes and nose above the water. This helps the crocodile catch animals that can't see it.



▲ Like turtles, tortoises have hard shells that protect them from enemies.

Summary

Amphibians are animals that begin life in water, change in form, and then live on land. Fish live in water, and use gills for breathing. Reptiles are animals that are covered with scales.

Review

1. What happens during the metamorphosis of a frog?
2. List three features that help fish live and move in water.
3. What do gills do?
4. Why do most amphibians live all their lives close to water?
5. **Test Prep** Which trait is shared by most fish, amphibians, and reptiles?
   - **A** gills
   - **B** scales
   - **C** eggs
   - **D** legs

LINKS

MATH LINK

Using Graphs
Take a survey of the kinds of fish that people keep as pets. Make a bar graph to show your results.

WRITING LINK

STORY
Write a story for younger children telling them how a frog changes from an egg into an adult.

CHAPTER 1 Review and Test Preparation

Vocabulary Review

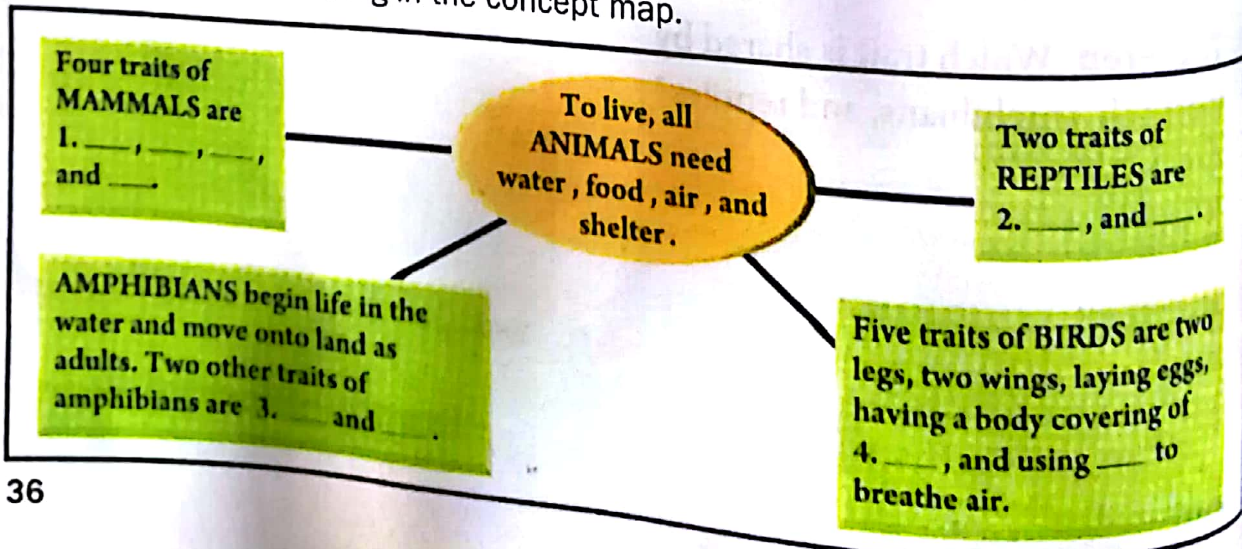
Use the terms below to complete the sentences 1 through 15. The page numbers in ( ) tell you where to look in the chapter if you need help.

- simple plants (14)
- seeds (15)
- germinate (16)
- mammals (22)
- amphibians (30)
- fish (32)
- fins (32)
- seedling (16)
- stamen (18)
- pistil (18)
- birds (25)
- gills (31)
- scales (32, 33)
- reptiles (33)

1. One trait of ____ is a body covering called fur.
2. Animals that begin life in water and later live on land are ____ .
3. Many new plants grow from ____ .
4. ____ have bodies covered with feathers.
5. ____ cover the body of fish.
6. Scales make it easy for ____ to glide through the water.
7. Young amphibians and fish use ____ to take in oxygen.
8. A seed needs water to ____ .
9. ____ have dry, scaly skin.
10. A young plant is a ____ .
11. A plant with no roots, stems, or leaves is a ____ .
12. ____ are body parts that help fish move.
13. Flowers form seeds at the bottom of the ____ .
14. ____ cover and protect a reptile's body.
15. The male part of the flower is called the ____ .

Connect Concepts

Write the terms that belong in the concept map.



To live, all ANIMALS need water, food, air, and shelter.

Four traits of MAMMALS are 1. ____, ____, ____, and ____.

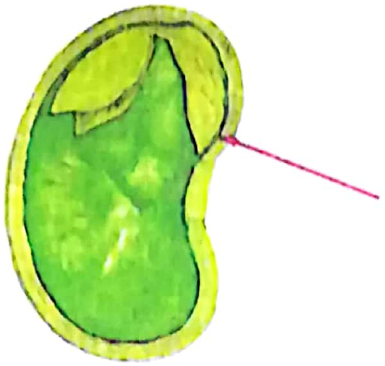
Two traits of REPTILES are 2. ____, and ____.

AMPHIBIANS begin life in the water and move onto land as adults. Two other traits of amphibians are 3. ____ and ____ .

Five traits of BIRDS are two legs, two wings, laying eggs, having a body covering of 4. ____, and using ____ to breathe air.

Check Understanding

Write the letter of the best choice.



1. Look at the picture. Which part of the seed is the arrow pointing to?
   - **A** stored food
   - **B** seedling
   - **C** seed coat
   - **D** stem
2. Simple plants have ____
   - **A** flowers
   - **B** spores
   - **C** cones
   - **D** seeds
3. Which kind of animal feeds its young with milk from its body?
   - **A** fish
   - **B** amphibian
   - **C** mammal
   - **D** bird
4. Which kind of animal has moist skin?
   - **A** bird
   - **B** reptile
   - **C** fish
   - **D** amphibian
5. Which kind of animal is a salamander?
   - **A** amphibian
   - **B** mammal
   - **C** fish
   - **D** reptile
6. Which of the following is a trait of mammals?
   - **A** lay eggs
   - **B** breathe with gills
   - **C** give birth to live young
   - **D** body is covered with scales

Answer the following two questions.

7. How does the breathing of fish differ from the breathing of reptiles?
8. Why would a crocodile die if it got stuck under the water and could not come up to the surface?

Process Skills Review

1. Use what you have learned about animals to **classify** these animals into groups: snake, robin, dog, lizard, cow, goose, whale. Explain why you grouped the animals as you did.
2. You are growing two plants. You want to test one plant to find out how sunlight affects its growth. You will provide the other plant with everything it needs to grow. **Plan an experiment** to find out. Explain how you will **observe** the plants and **compare** your results.
3. How can you use your senses to **observe** birds.

Performance Assessment

Grouping Animals

Use animal cards. Group them by using what you have learned about animals. Are there any animals that don't belong in a group? What traits did these animals have?

CHAPTER
2
Where Living Things Are Found

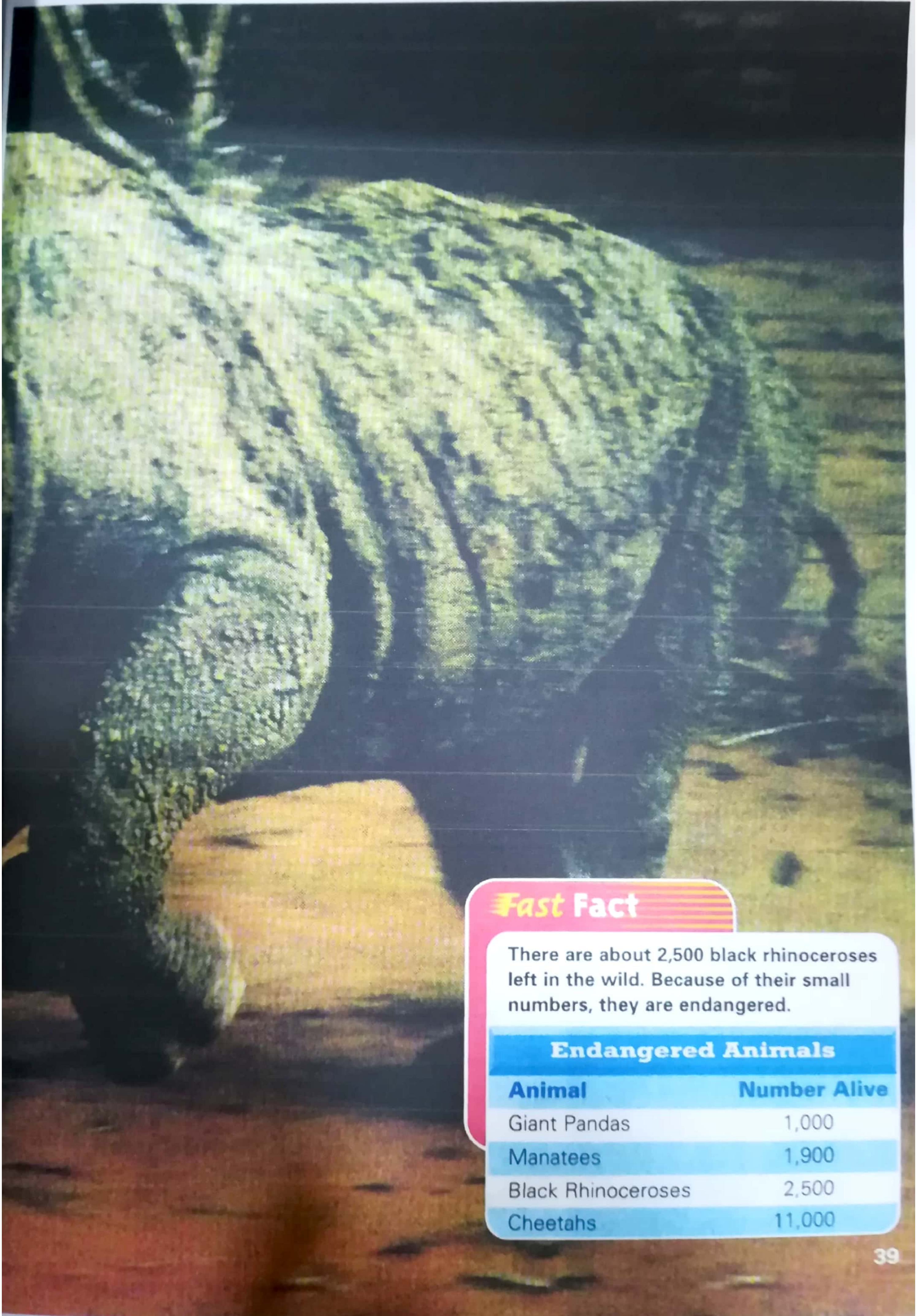
Vocabulary

- environment
- desert
- permanent snow line
- deciduous trees
- evergreen trees
- salt water
- fresh water

Living things are all around us—in the air, on the land, and in the water. In this chapter you'll explore where living things are found and how their bodies and behaviors help them in their environments.

Fast Fact

The ground cone is one of the most unusual wildflowers. It looks like a pine cone sitting on the ground. Since most animals don't eat pine cones, this is a great way of hiding!



Fast Fact

There are about 2,500 black rhinoceroses left in the wild. Because of their small numbers, they are endangered.

Endangered Animals	
Animal	**Number Alive**
Giant Pandas	1,000
Manatees	1,900
Black Rhinoceroses	2,500
Cheetahs	11,000

LESSON 1

What Is a Desert Environment?

In this lesson, you can . . .

INVESTIGATE a desert ecosystem.

LEARN ABOUT desert ecosystems.

LINK SCIENCE to math and health.

INVESTIGATE

Make a Desert Environment

Activity Purpose A desert is a very dry place. But this environment is home to many kinds of living things. In this investigation you will **make a model** of a desert environment.

Materials

- cardboard box
- plastic wrap
- 2 or 3 desert plants
- sandy soil
- small rocks

Activity Procedure

1. **Make a model** of a desert environment. Start by lining the cardboard box with plastic wrap. Place sandy soil in the box. Make sure the soil is deep enough for the plants.
2. Place the plants in the soil, and place the rocks around them. Lightly sprinkle the soil with water. (Picture A)

◀ This scorpion is one type of animal that lives in the desert.

3. Put your desert environment in a sunny place. (Picture B)
4. Everyday use your finger to **observe** how dry the soil is. If the soil is *very* dry, add a small amount of water. Be careful not to water the plants too much.
5. Continue to **observe** and care for your desert model. **Record** what you observe.

Picture A

Draw Conclusions

1. What kind of environment does your model represent?
2. How does **making a model** help you learn about a desert?
3. **Scientists at Work** Scientists often learn by **making models**. What other types of environments can you make models of?

Picture B

Process Skill Tip

Observing a desert would be difficult to do in the classroom. To learn more about the real thing, you can **make a model** of a desert.

LEARN ABOUT

Desert Environment

FIND OUT

- about the desert environment
- how plants and animals get what they need in a desert environment

VOCABULARY

environment

desert

Characteristics of Deserts

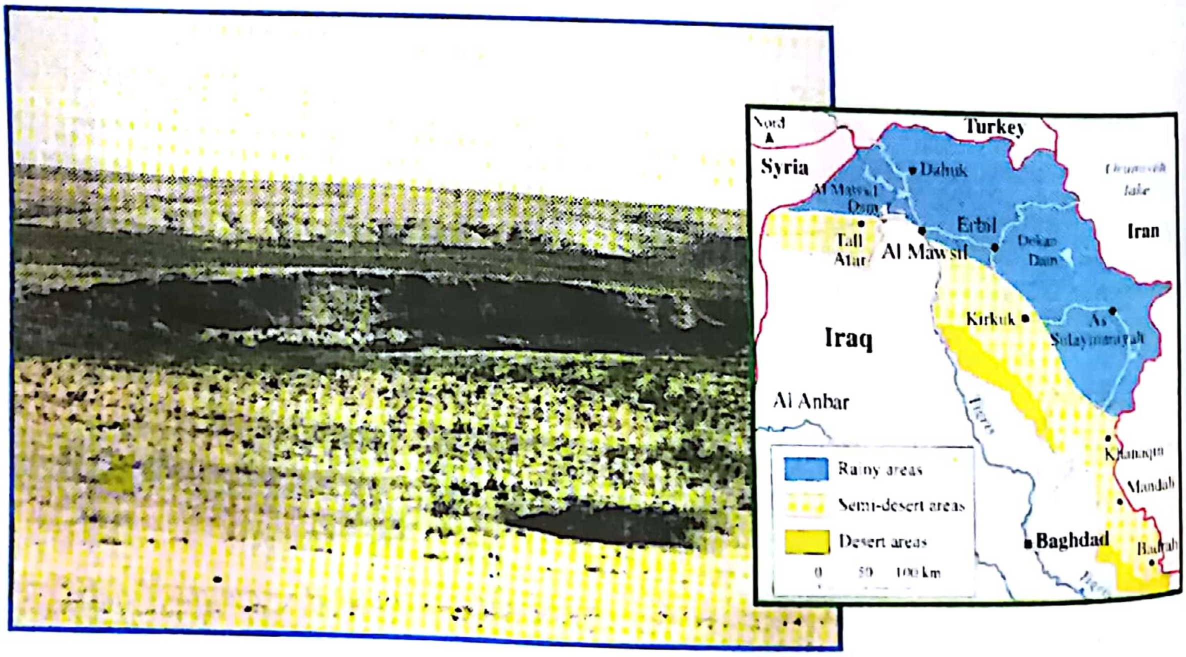
In the investigation you observed a model of a desert environment. An **environment** is all the living and nonliving things that make up an area or region.

A **desert** is an environment where there is very little rainfall. Many years could even pass without a desert getting any rainfall. In summer, it is very hot in daytime but the heat decreases during the night.

In the semi-desert areas bordering deserts rain falls every year, but the amount is not much more than what a desert gets, and the average temperatures are also similar. About half the area of Kurdistan region-Iraq is semi-desert. Karkouk and south of Erbil governorate are semi-desert areas.

✓ **What are the characteristics of the desert environment?**

▼ A semi-desert area in Karkouk.



Desert Plants

Plants are very rare in the desert. Plants that grow in deserts have parts that help them get water and save it. Some desert plants have long roots that spread out near the top of the soil. Here the roots can easily soak up water when it does rain.

Some desert trees and bushes such as Acacia trees have long roots that grow deep into the ground to reach the deep layers of the soil that have water.

▲ Yarrow, rye and wormwood grow in semi-desert areas

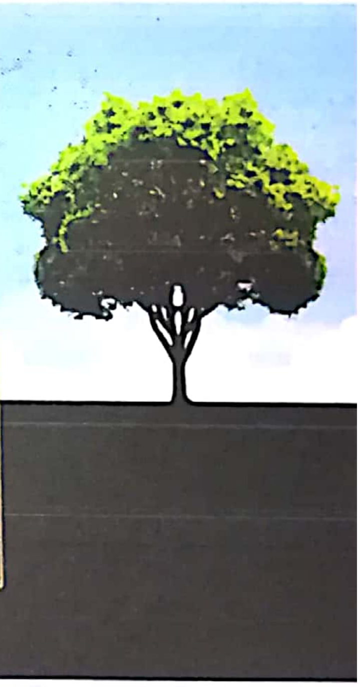
Many desert plants, such as cactus, have thick stems that store water. Some animals eat these stems to get the water they need to live.

In semi-desert areas, plants increase gradually as we move away from desert. These plants include sparsely spread bushes with interspersed grasses especially spiny grasses. Yarrow (kaisoum), rye (shaylam) and wormwood (shih) are examples of semi-desert plants in Kurdistan region.

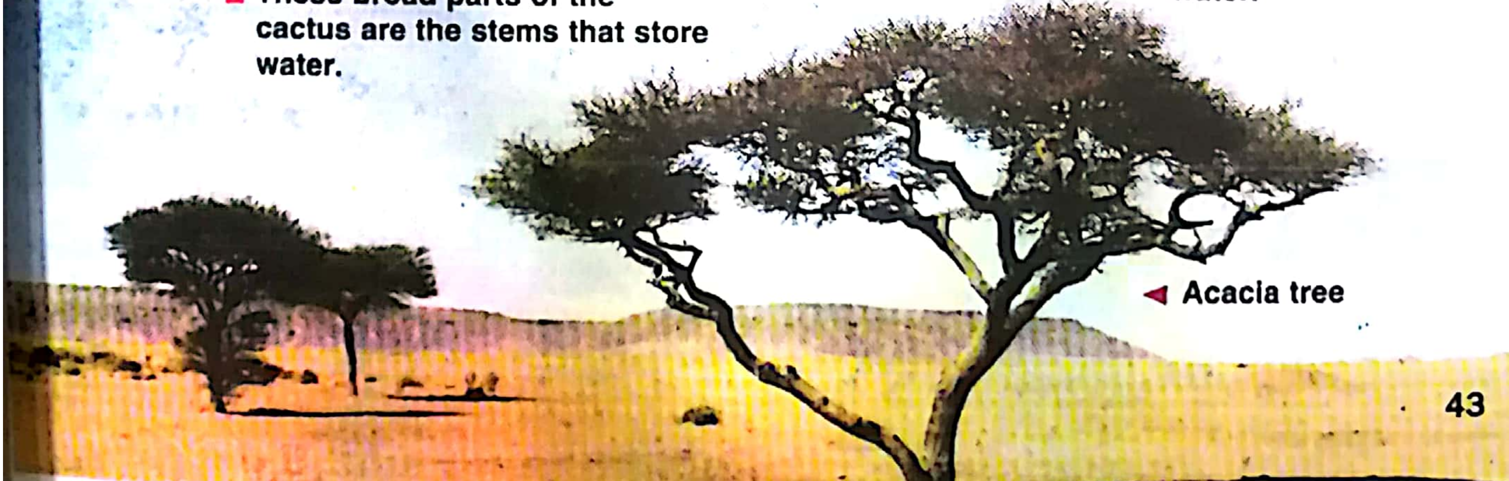
✓ How do desert plants get water?

▲ These broad parts of the cactus are the stems that store water.

▲ The roots near the surface of the soil absorb rain water quickly.



▲ Deep spreading roots to reach the water.



◄ Acacia tree

▲ The deer is an animal of the semi-desert environment.

Desert Animals

Very few animals live in the desert, because water is rare. Desert animals get most of their water by eating plants that store water and by eating other animals.

Reptiles such as snakes and lizards that live in the desert stay in burrows during the day to avoid the heat. Scorpions and insects are other desert animals. These animals have hard body coverings that keep them from losing too much water.

Small desert mammals such as rabbits, mice, and jerboas are active during the night or early morning, when the air is cooler. During the day they sleep in their burrows, which protect them from heat and dryness.

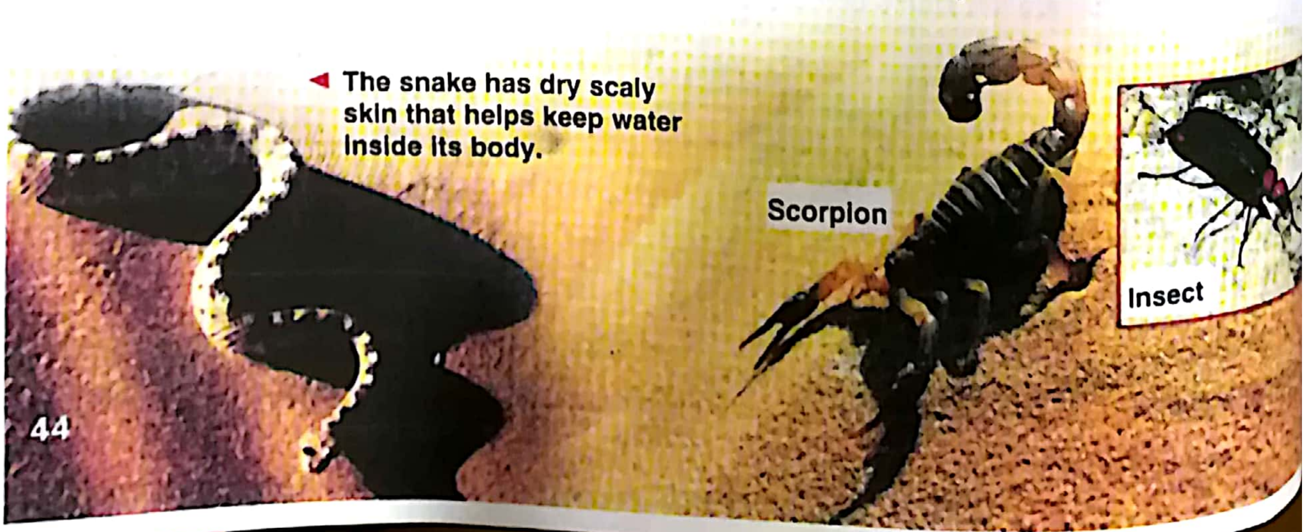
More plant eating animals, such as deer live in semi-desert environments, where there is plenty of grass and where water is found in ponds and small springs.

▲ A lizard in the shade.

✓ **How do desert animals get water?**

▲ The jerboa and rabbit are active at night in the desert.

▼ The insect and scorpion have a hard cover that protects them from dryness.



◄ The snake has dry scaly skin that helps keep water inside its body.

Summary

A desert is a dry environment, whereas the semi-desert environment is less dry. Plants and animals that live in deserts have parts that help them get what they need to live. For more kinds of plants and animals live in semi-desert environments than in desert environments.

Review

1. What is a desert?
2. How does the semi-desert environment differ from the desert environment?
3. Where do desert plants store water?
4. Other than eating plants, how do desert animals get water?
5. **Test Prep** Living things in deserts suffer the most from _____

   A heat
   B few kinds of plants
   C very little water
   D plenty of water

The large ears of this fennec help it hear its enemies. The fennec also gets rid of extra heat from its body through the thin skin of its ears. ►

LINKS

MATH LINK

Measure Volume
Desert plants store water. To get an idea of how much water a plant can store, squeeze a piece of fruit over a bowl. Measure the amount of juice that comes out.

HEALTH LINK

Water and Health
Your body needs plenty of water when it is hot outside. With a partner, make a list of 5 things you can do to save the water in your body on a hot day.

LESSON 2

What Is a Mountain Environment?

In this lesson, you can . . .

INVESTIGATE a mountain environment.

LEARN ABOUT mountain environments.

LINK SCIENCE to math and social studies.

INVESTIGATE

Make a Mountain Environment

Activity Purpose A mountain does not have the same condition all around, because the temperature varies between the low places of the mountain and the high places. Plants and animals of the mountain environment vary according to the height. In this investigation you will **make a model** of a mountain environment.

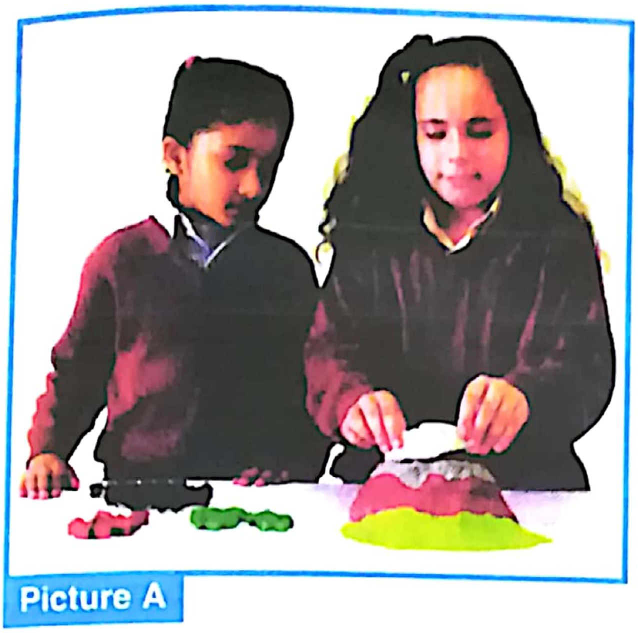
Materials

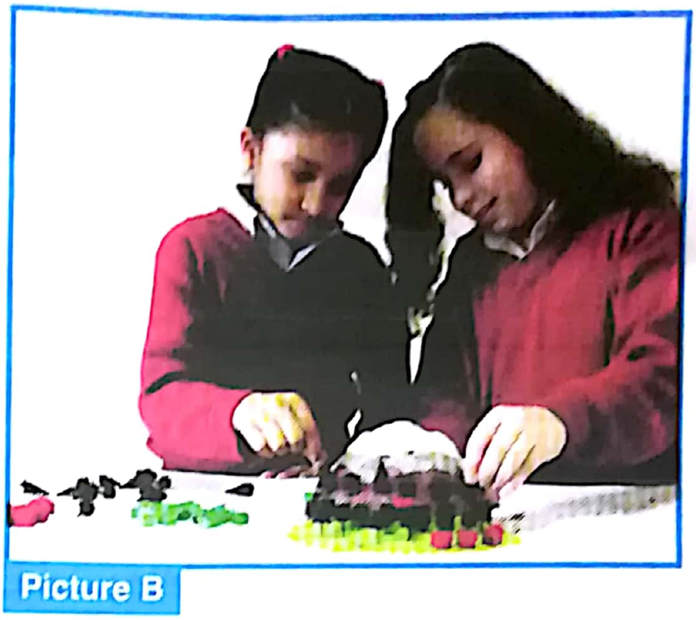
- broad piece of cardboard
- Modeling clay of different colors (brown, green, gray, white).
- small plastic trees (pine, cypress, oak)
- 5 small houses

Activity Procedure

1. **Make a model** of a mountain environment. Flatten the green clay on the cardboard into a circular shape two centimeters thick, with sloping edges.

◄ This marmot that looks like a squirrel lives in high mountain areas. In the cold winter it takes shelter in a burrow and sleeps until spring.


Picture A


Picture B

2. Repeat step 1 with the brown, gray, and white clay in this order, making smaller and smaller round layers, and place over the green base with the white layer on top. You now have a **model** of a mountain. (Picture A)
3. Place the small houses around the edge of the first layer
4. Plant 10 to 15 oak trees around the edge of the first layer too.
5. Plant 8 to 10 oak and pine trees around the edge of the second layer.
6. Leave the third and fourth layers without trees. You now have a **model** of the occurance of plants in a mountain environment.

Draw Conclusions

1. Why do the kinds of forests differ from one layer to another in a mountain environment?
2. Why does the number of trees decrease in the upper layers of the mountain environment?
3. Why did we use the white clay for the uppermost layer of the mountain?
4. **Scientists at Work** Scientists often learn by **making a model.** What did you learn about forests from this model?

Process Skill Tip

When you make a **model**, you try to make it like the real thing. You can learn some details about the real thing from the **model.**

LEARN ABOUT

Mountain Environment

FIND OUT

- the mountain environment
- how kinds of plants and animals vary in the mountains.
- how plants and animals are adapted to life in the mountain environment

VOCABULARY

permanent snow line

deciduous trees

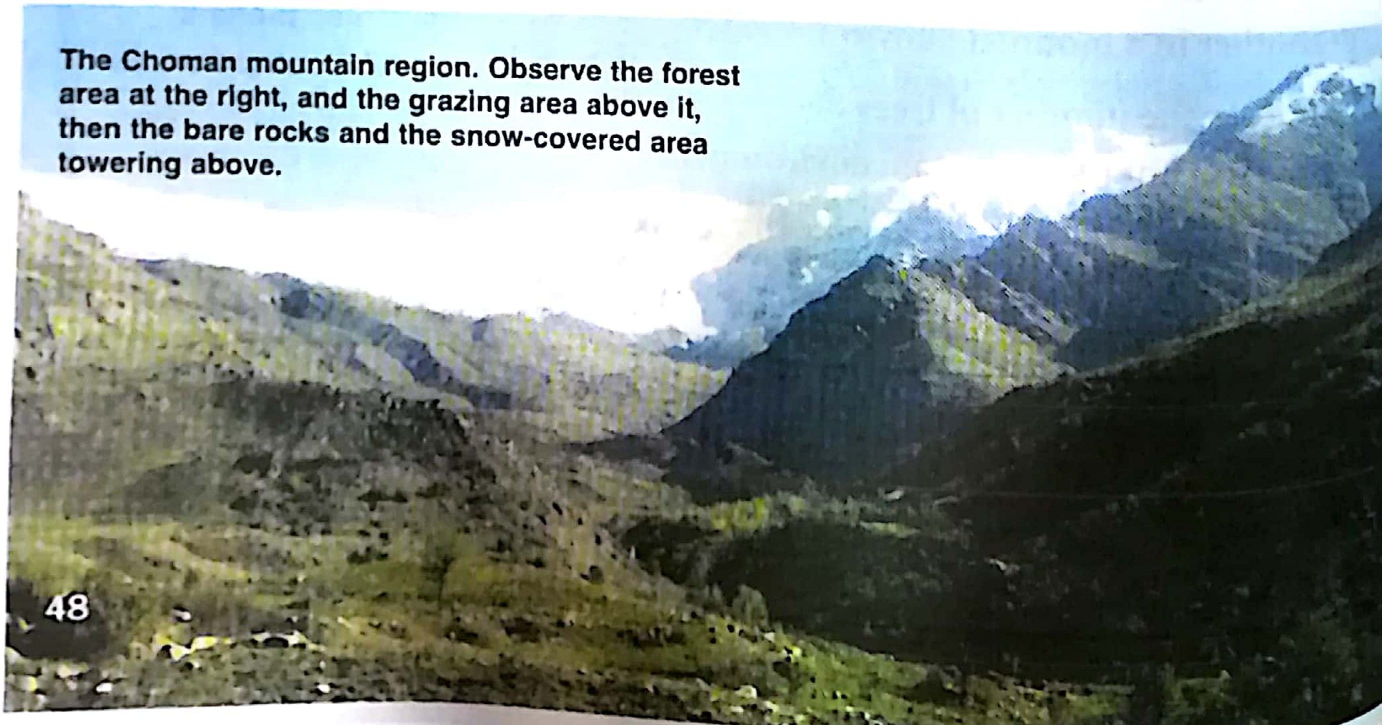
evergreen trees

Characteristics of the Mountain Environment

As we climb up the mountain the temperature of the air decreases. That is why the air at the mountaintop is colder than at the bottom. Much more rain falls on mountains than on the surrounding lowlands. Precipitation in the higher mountain regions is mostly in the form of snow. In many mountains snow remains on the peaks all year round because of the extreme cold. These regions are called the regions of permanent snow, and the line above which snow remains all year round is called the **permanent snow line**.

Mountains cover a wide area of Kurdistan region - Iraq. In Choman mountains for example, the permanent snow line is at an altitude of 3500 meters.

✓ **How does temperature change in the mountain environment?**



The Choman mountain region. Observe the forest area at the right, and the grazing area above it, then the bare rocks and the snow-covered area towering above.

Mountain Plants

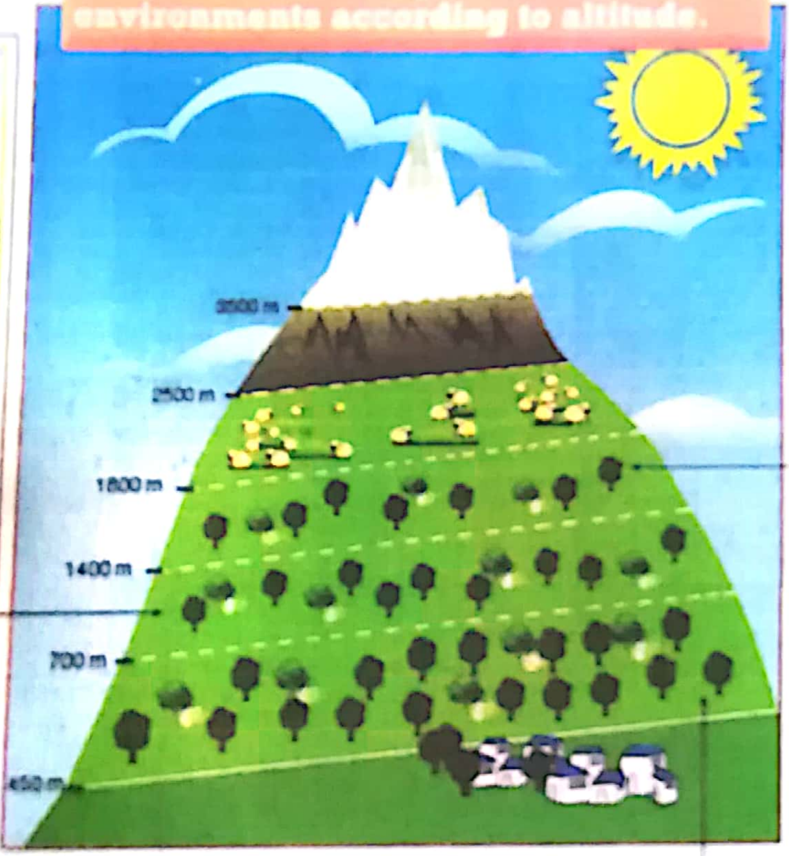
In the mountain environments plants vary according to altitude, because the temperature of the air changes at different altitudes. In the mountains of Kurdistan region - Iraq, forests of mainly ordinary oak occur in the lower regions.

Bushes of hawthorn, sumac, and pistacia (source of Kurdish gum) grow among the oak trees. Above the ordinary oak region extend forests of mainly gall oak with bushes of juniper and balalok growing among the oak. Forests of pine trees occur in Zawita and Atrosh at the same altitude.

Above the region of gall oak occur forests of Lebanese oak trees, together with other plants that can endure cold, such as maple trees, pistacia, and muhallab bushes.

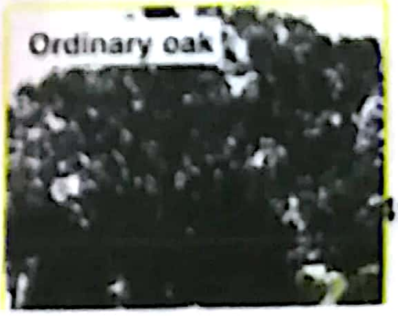
▲ Pine leaves are like needles, and pine seeds grow in cones.

The distribution of plants in mountain environments according to altitude.



▼ Bushes of hawthorn and sumac grow among oak trees.

▼ Foresrts in Kurdistan region - Iraq are mostly oak forests.



Above the region of forests extends a region of pastureland and grasses such as moss. Above this region extends a region of nearly bare rock. Finally, beyond and above this region is the region of permanent snow.

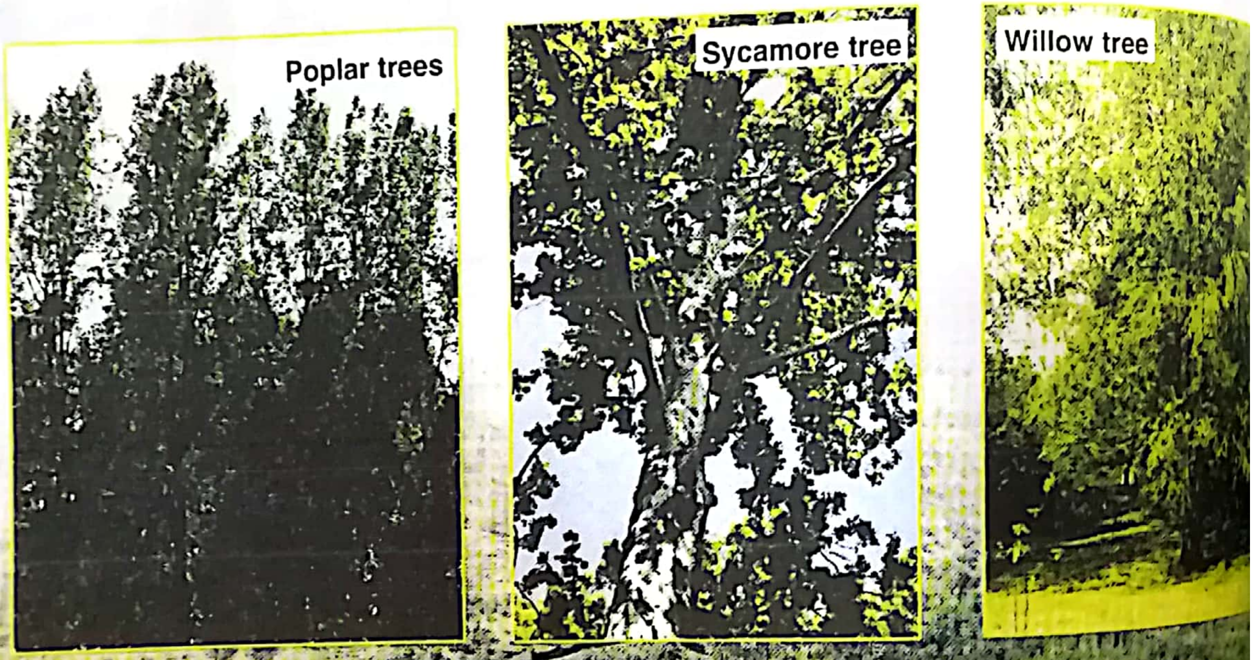
In valleys and on river banks grow trees that like water, such as willow, sycamore and poplar trees.

✓ **List the distribution of mountain plants from the lower region to the highest.**

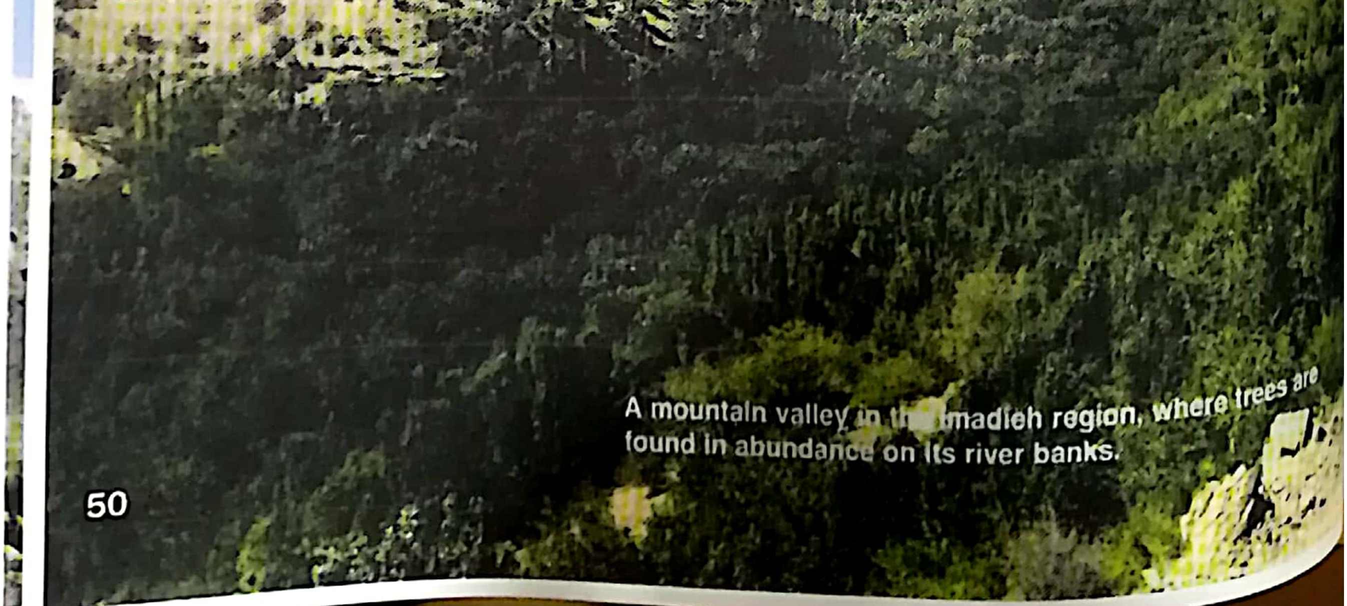
Two kinds of Trees

Oak, willow, poplar, and maple tree are deciduous trees. **Deciduous trees** are the trees whose leaves fall in autumn because of the cold. New leaves begin to grow in the next spring.

Pine trees are evergreen trees. **Evergreen trees** are trees whose leaves do not fall at the same time. They have green leaves througout the year.



▲ Sycamore, willow and poplar trees thrives on river banks.

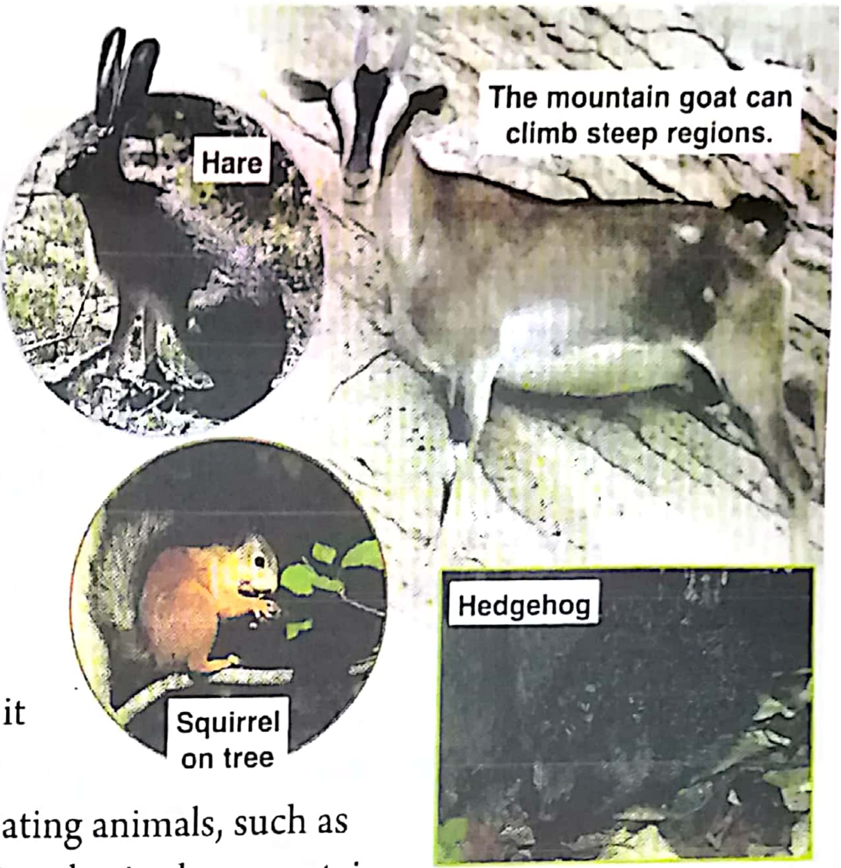


A mountain valley in the Amadieh region, where trees are found in abundance on its river banks.

Mountain Animals

Many kinds of animals live in the mountains. Some kinds eat plants, while other kinds eat animals. In the mountains of Kurdistan region - Iraq, live many kinds of animals too. Of these is the mountain goat, which lives at high altitudes ranging between 1500m and 2000m. Its flexible hooves allow it to move quickly and steadily on rocky rough paths. Other plant eating animals, such as hedgehogs, squirrels, and hares live also in the mountains of Kurdistan region - Iraq.

Together with these animals live their natural enemies, the wolves, foxes, jackals, hyenas, and brown bears that are all meat eaters.



The mountain goat can climb steep regions.

▲ Plant-eating Mountain animals.

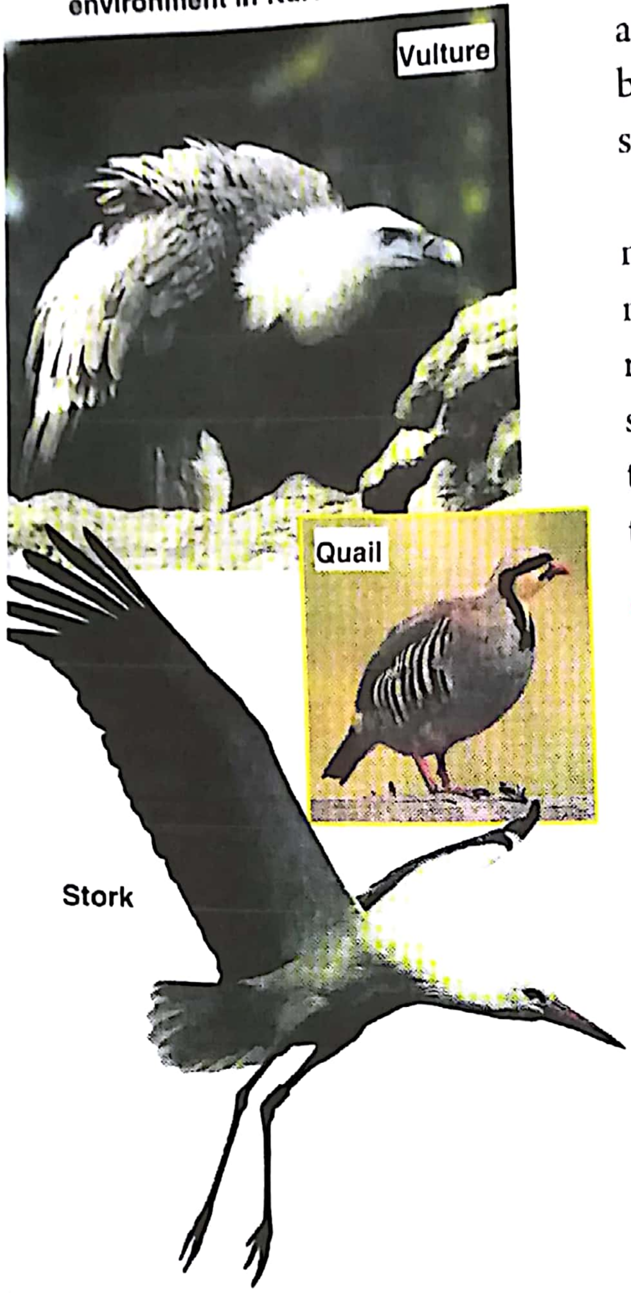
▼ Meat-eating mountain animals.

Many kinds of birds too live in the mountains of Kurdistan region - Iraq such as vultures and quails, which are indigenou birds, in addition to migrating birds that seek warmth, such as white storks.

Some mammals that live in high regions move just before winter to the warmer middle and lower regions. They then return to their original habitats in the next spring. Some rodents make shelters below the snow, and sleep all through the winter, then become active again in spring.

✓ **Tell of one way animals living in high regions avoid the cold winter.**

▼ Common birds of the mountain environment in Kurdistan - Iraq.



▼ Some animals sleep in wint

▼ Animals moving to a warmer region.

Summary

The air gets colder and rainfall increases in mountain regions as we climb higher. Precipitation on mountaintops is in the form of snow. Plants in mountain environments differ from one region to another according to altitudes because of the differences in temperature. Various animals live in mountain environments. Some of them are plant eaters and others are meat eaters.

Review

1. How does the amount of precipitation differ among the regions of the mountain environment?
2. How are the kinds of plants distributed in the mountain environment? What determines this distribution?
3. Explain one way mountain animals protect themselves from the changes of the environmental conditions.
4. Why plants do not grow in the region of permanent snow?
5. **Test Prep** Which of the following plants grow in the lower regions of a mountain?

   A pine trees
   B oak trees
   C evergreen trees
   D mosses

LINKS

MATH LINK

Bar Graph

Use the following table to draw a bar graph that allows you to compare the variation in the height of the permanent snow line in different regions of the world.

Mount Region	Height of Permanent Snow Line
East Himalaya	4500 m
Western United States	3500 m
Southern Norway	1000 m
Alps	2800 m
Halkord (Kurdistan)	3607 m

SOCIAL STUDIES LINK

Report

Find out the kind of trees that grow in the region where you live. Write a report about the trees of the region, and mention the most abundant kind. Include drawings of the leaves of some kinds of trees.

LESSON 3

What Are Water Ecosystems?

In this lesson, you can . . .

INVESTIGATE freshwater ecosystems.

LEARN ABOUT two types of water ecosystems.

LINK SCIENCE to math and social studies.

Dolphins live, swim, and play in saltwater ecosystems.

INVESTIGATE

Make a Freshwater Ecosystem

Activity Purpose If you have ever visited a lake, you may know that many kinds of plants and animals live there. Lakes and ponds are freshwater ecosystems. In this investigation you will **make a model** of a freshwater ecosystem.

Materials

- aquarium or other large, clear plastic container
- sheet of paper
- freshwater plants
- rocks
- fish
- sand
- fresh water
- gravel

Activity Procedure

1. Put a layer of gravel at the bottom of the aquarium. Add a layer of sand on top of the gravel.

2. Set the aquarium in a place where it isn't too sunny. Place a sheet of paper over the sand. Slowly add the water to the tank. Make sure you pour the water onto the paper so the sand will stay in place. (Picture A)

3. Remove the paper, and put the plants and rocks into the tank. Let the tank sit for about one week. After one week, add the fish to the tank. (Picture B)

4. **Observe** and care for your freshwater ecosystem.

Picture A

Picture B

Draw Conclusions

1. What are some things you **observed** in your freshwater ecosystem?
2. Why do you think you waited to add the fish to the tank?
3. **Scientists at Work** Scientists often **make a model** of an ecosystem so they can **observe** it in a laboratory. How did making a model help you observe a freshwater ecosystem? How is your model different from a real pond?

Process Skill Tip

It can be difficult to **observe** all the living things in a freshwater pond or lake. You can learn about the real thing by **making a model** of a freshwater ecosystem.

LEARN ABOUT

Water Ecosystems

FIND OUT

- about freshwater and saltwater ecosystems
- what plants and animals live in water ecosystems

VOCABULARY

salt water
fresh water

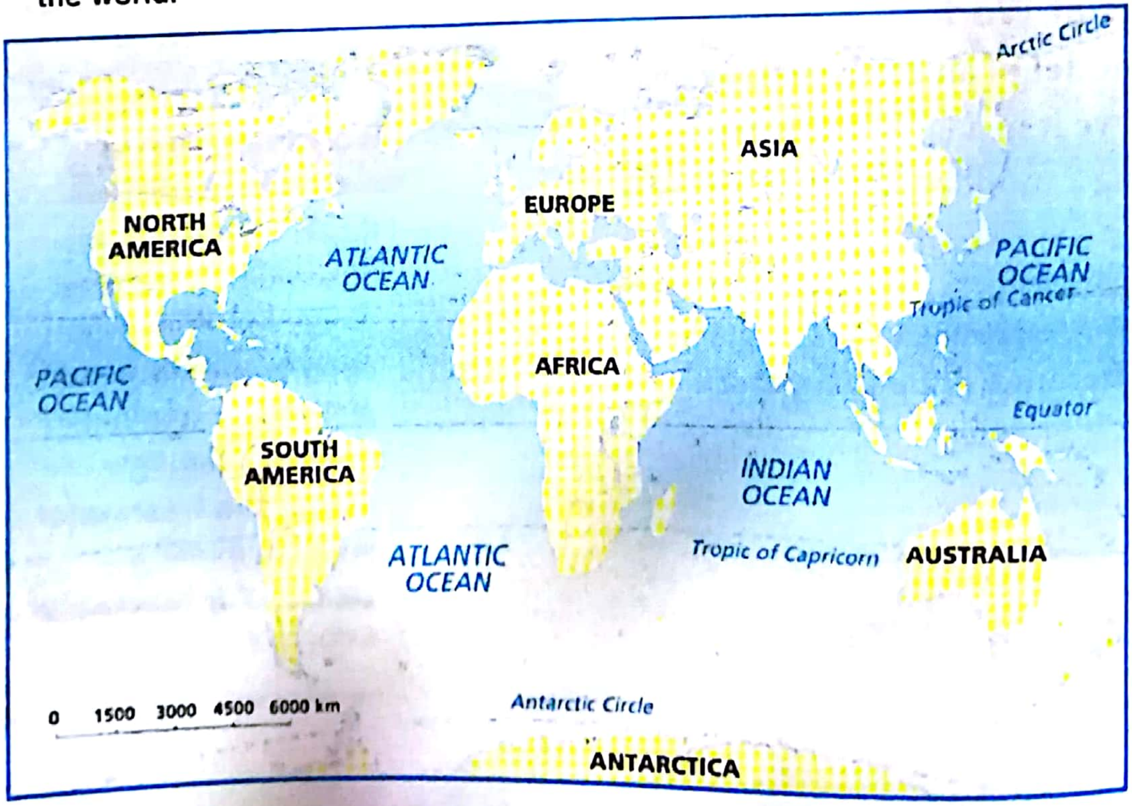
Types of Water Ecosystems

Water covers more than 75 percent of Earth's surface. When you look at a globe, you can see that most of this water is in oceans and seas. Oceans and seas contain **salt water**, or water that has a lot of salt in it. Marshes and a few lakes also have salt water in them. These ecosystems are called *saltwater ecosystems.*

In the investigation you made a model of a freshwater ecosystem. **Fresh water** is water that has very little salt in it. Lakes, rivers, ponds, streams, and some marshes are *freshwater ecosystems.*

✓ **What are two types of water ecosystems?**

▼ The blue parts of this map show the major water ecosystems of the world.



Saltwater Ecosystems

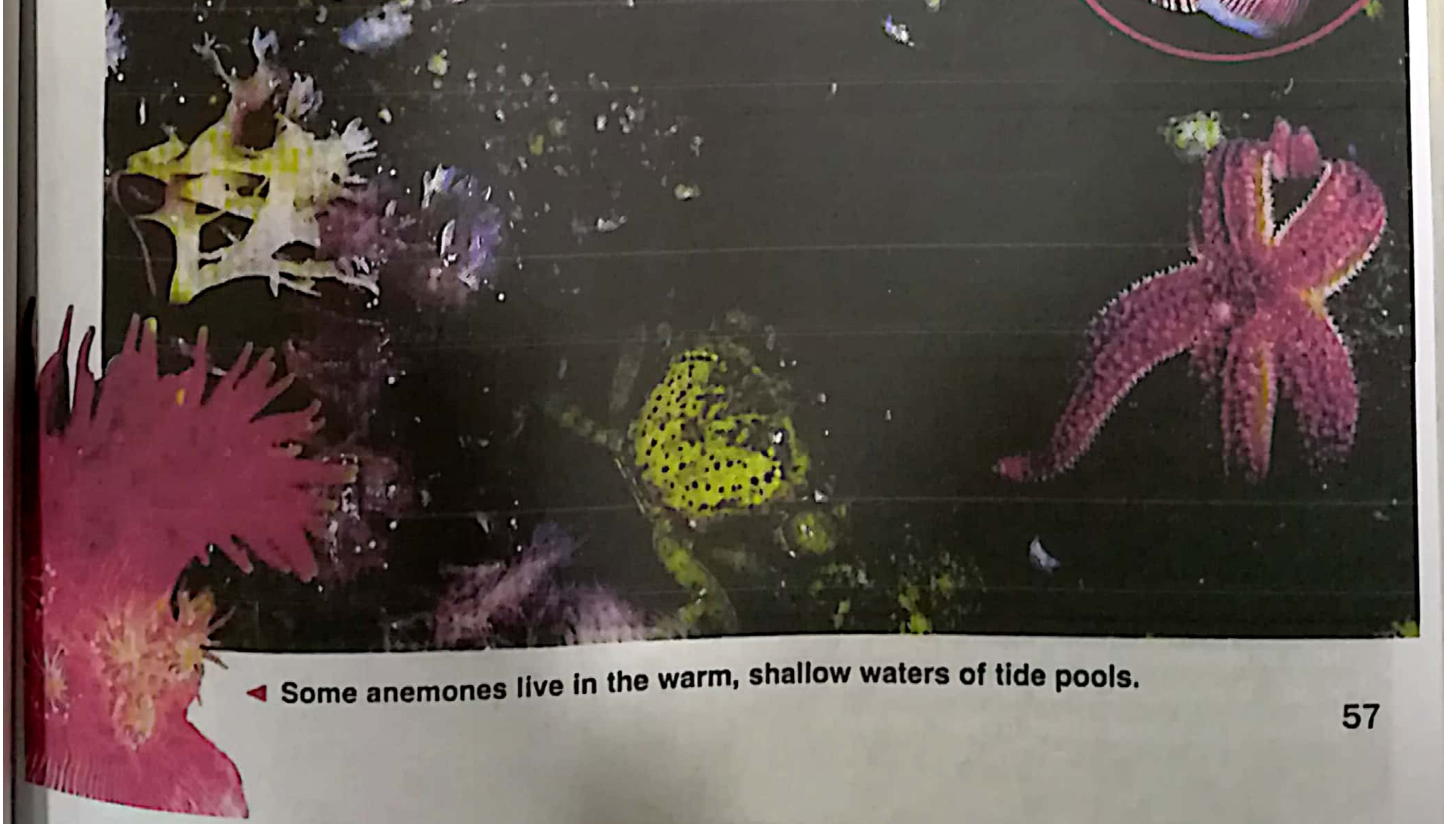
There are many different saltwater ecosystems because salt water is not the same everywhere. The amount of salt in ocean water is different in different places. Near the surface, rain can make the water less salty. Water is also less salty near shores where fresh water from rivers and streams flows into oceans. But no matter where you are in the ocean, the water has more salt in it than fresh water has.

Ocean water that is near shore or at the surface is often warmer than water deep in the ocean. This is because the sun warms the water in these areas.

✓ **Why might salt water be less salty near shore?**

▼ Barnacles are small animals that live out their lives stuck to rocks and other objects.

▼ Different kinds of animals and plants live in warm shallow waters.



◄ Some anemones live in the warm, shallow waters of tide pools.

Ocean Ecosystems

The oceans are Earth's largest ecosystems. Because they are so large, many kinds of plants and animals live in them. All these living things are suited to life in salt water.

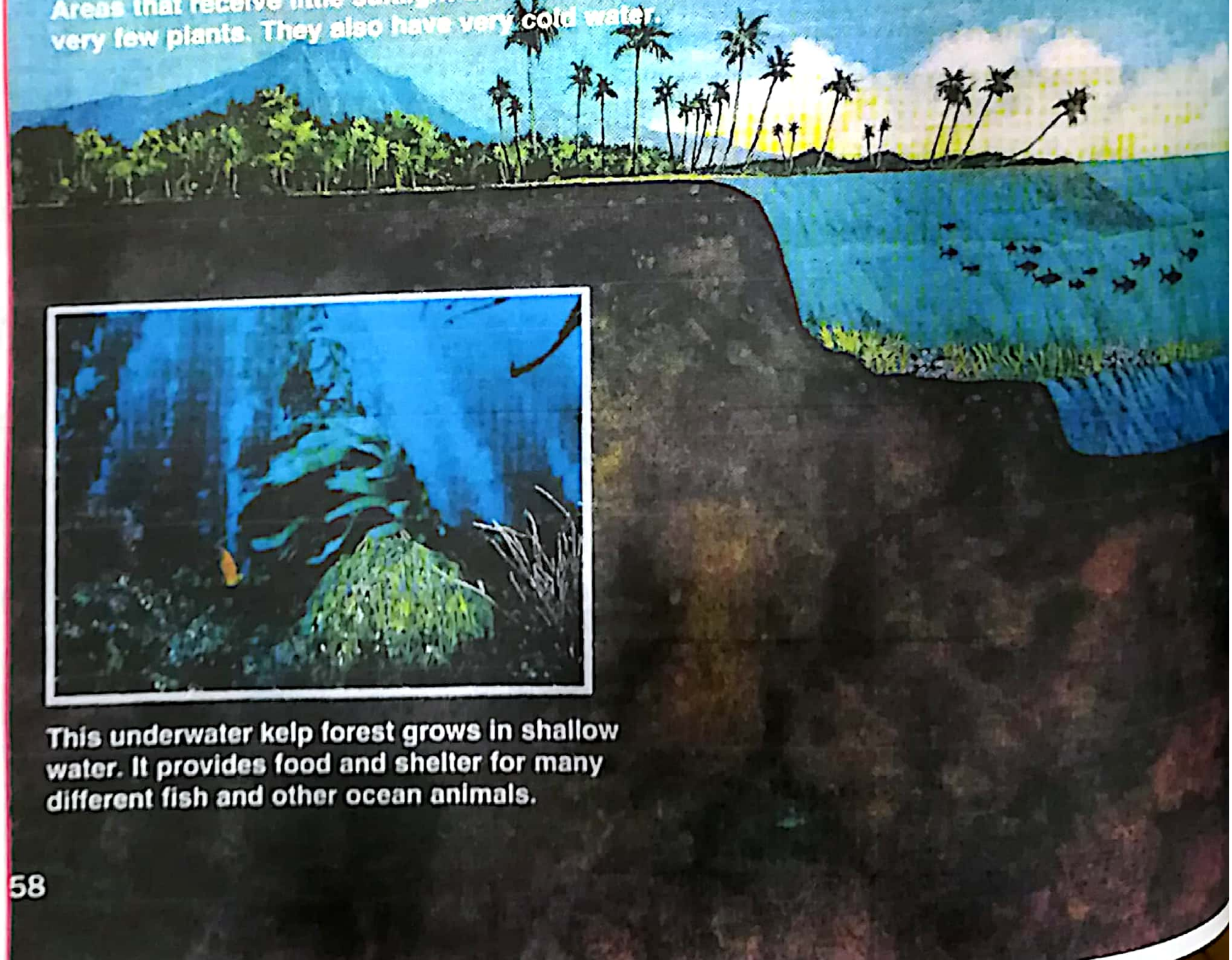
Not all parts of the ocean are the same. The saltiness of the water can be different. Water is deeper in some places than in others. The water temperature also changes from place to place. All these differences, along with how deep into the water the sunlight can reach, affect the kinds of living things that are found in different parts of the ocean.

✓ **What do all ocean plants and animals have in common?**

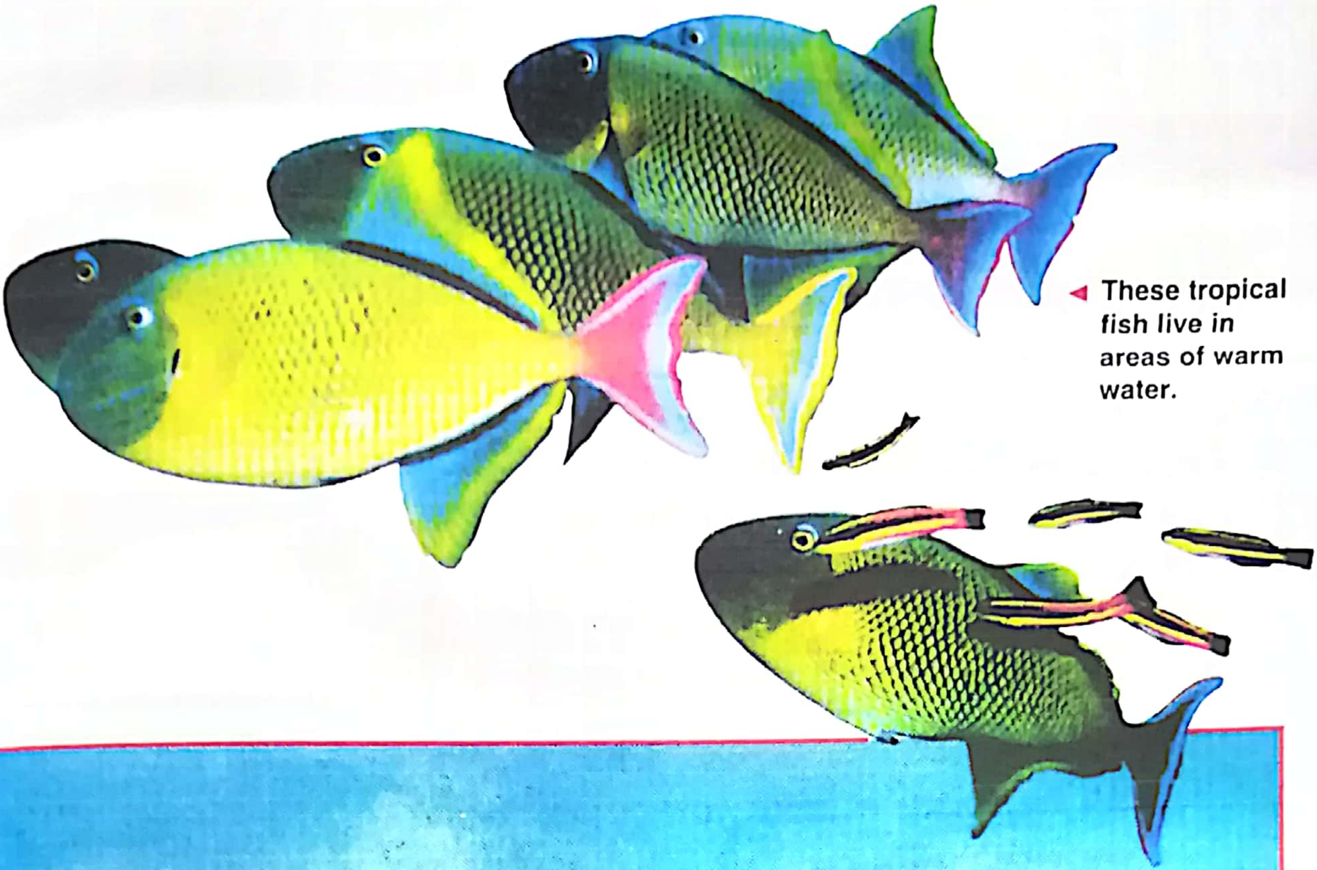
THE INSIDE STORY

Ocean Zones

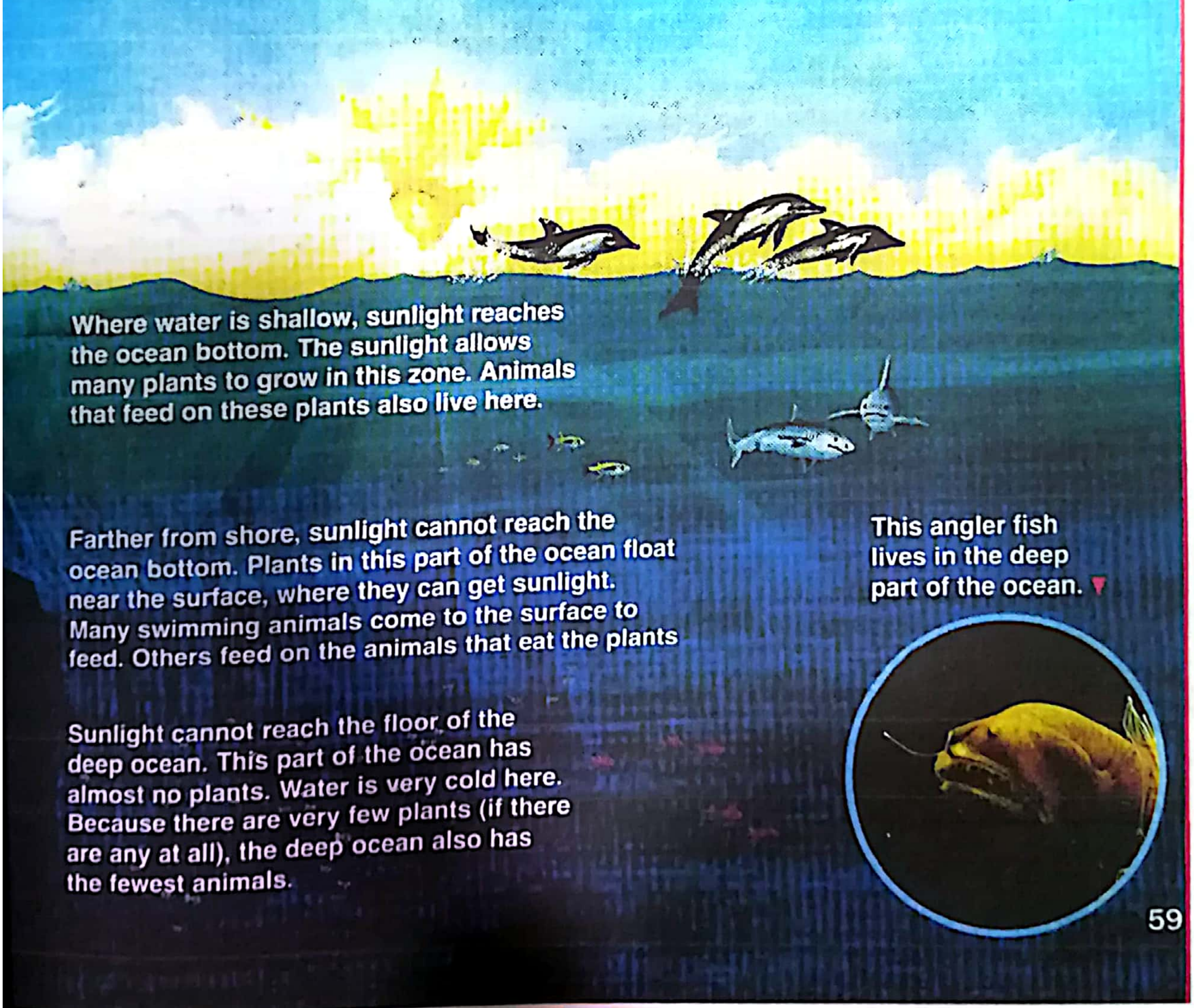
The ocean can be divided into zones. Each zone is defined by how much sunlight it gets. Areas that get the most sunlight usually have the warmest temperatures and more plant and animal life. Areas that receive little sunlight are dark and have few animals and very few plants. They also have very cold water.



This underwater kelp forest grows in shallow water. It provides food and shelter for many different fish and other ocean animals.



These tropical fish live in areas of warm water.



Where water is shallow, sunlight reaches the ocean bottom. The sunlight allows many plants to grow in this zone. Animals that feed on these plants also live here.

Farther from shore, sunlight cannot reach the ocean bottom. Plants in this part of the ocean float near the surface, where they can get sunlight. Many swimming animals come to the surface to feed. Others feed on the animals that eat the plants

Sunlight cannot reach the floor of the deep ocean. This part of the ocean has almost no plants. Water is very cold here. Because there are very few plants (if there are any at all), the deep ocean also has the fewest animals.

This angler fish lives in the deep part of the ocean.

Freshwater Ecosystems

Not all freshwater ecosystems are the same. The main kinds of freshwater ecosystems include rivers, streams, lakes, and ponds.

Many plants and animals live in or around rivers and streams that have moving fresh water. How fast the water moves helps determine what living things can survive in the water.

The water in lakes and ponds is still. Lakes are usually larger and have deeper water than ponds.

Still, as in an ocean, most plants and animals in a lake or pond live in the shallow water that gets the most sunlight.

✓ **What are two kinds of freshwater ecosystems?**

▲ This cooter turtle is a common shore animal of ponds, rivers, marshes, and lakes.

▼ This egret is a wading bird that lives near freshwater ecosystems such as lakes.

▼ A young mayfly can stick to a rock or a plant so fast-moving water won't wash it away.

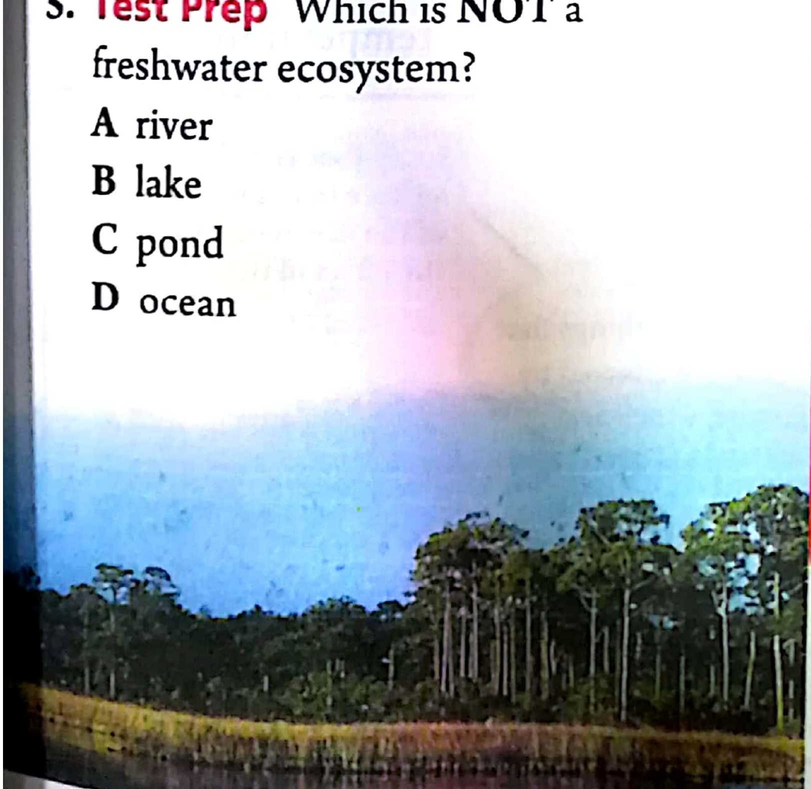
▼ The bullhead catfish makes its home in a lake.

Summary

Water ecosystems may have salt water or fresh water. An ocean is a saltwater ecosystem. Rivers, streams, lakes, and ponds are freshwater ecosystems. Different kinds of plants and animals live in and around these water ecosystems.

Review

1. What are the two kinds of water ecosystems? Name two ways they are different.
2. In a pond, where do most of the animals live?
3. Which zone of the ocean gets the least amount of sunlight?
4. What would happen to the animals and plants in a saltwater ecosystem if it were flooded by fresh water? Explain your answer.
5. **Test Prep** Which is **NOT** a freshwater ecosystem?
   - **A** river
   - **B** lake
   - **C** pond
   - **D** ocean



LINKS

MATH LINK

Construct a Graph
Use a computer graphing program such as *Graph Links* to make a bar graph of the following water depths: river, 1 meter, lake, 6 meters, ocean, 122 meters. How much deeper is the ocean than the lake.

SOCIAL STUDIES LINK

Freshwater Ecosystems in Kurdistan Region
Identify three freshwater ecosystems in Kurdistan region. Learn about the area and depth of each, and about some plants and animals that live in them. Write all in a report to present to your classmates.

CHAPTER 2 Review and Test Preparation

Vocabulary Review

Use the terms below to complete the sentences 1 through 7. The page numbers in ( ) tell you where to look in the chapter if you need help.

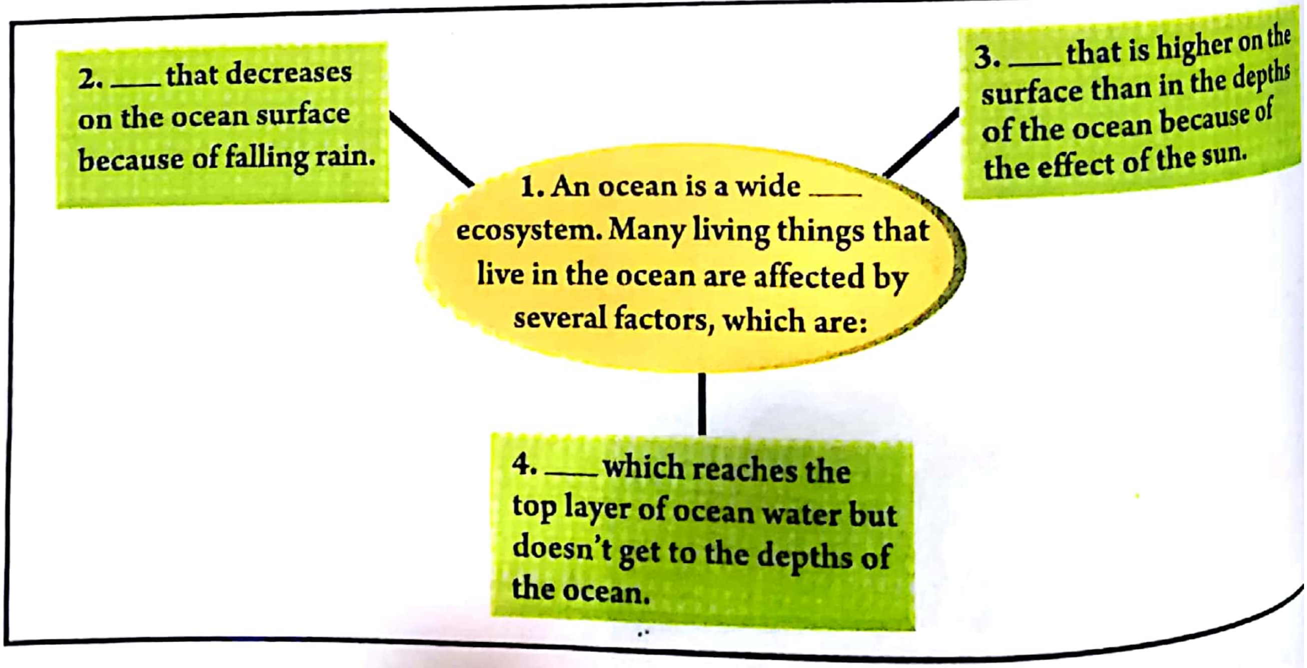
environment (42)
desert (42)
permanent snow line (48)
deciduous trees (50)
evergreen trees (50)
salt water (56)
fresh water (56)

1. An environment that is very dry is a ____ .
2. Leaves remain on ____ all year round.
3. An ____ is everything that surrounds a living thing.
4. The water in the ocean is ____ .
5. Snow remains throughout the year above ____ .
6. Rivers and most lakes are ____ ecosystems.
7. Trees that shed all its leaves in the autumn are ____ .

Connect Concepts

Write the terms from the Word Bank where they belong in the concept map.

sunlight **saltwater** **amount of salt** **temperature**



1. An ocean is a wide ____ ecosystem. Many living things that live in the ocean are affected by several factors, which are:

2. ____ that decreases on the ocean surface because of falling rain.

3. ____ that is higher on the surface than in the depths of the ocean because of the effect of the sun.

4. ____ which reaches the top layer of ocean water but doesn't get to the depths of the ocean.

Check Understanding

Write the letter of the best choice.

1. Rain falls on the desert ____
   A every year
   B once every 5 years
   C in big amounts
   D in very small amounts
2. What are the two types of water ecosystems ____
   A fresh and salt
   B hot and cold
   C hot and dry
   D lighted and dim
3. Plants of water ecosystems live ____
   A at all depths
   B in dark regions
   C in lighted regions
   D on the surface only
4. Most desert animals become active ____
   A at daytime
   B at night
   C in summer
   D throughout the day
5. Where in the mountain environment do we find forests of trees that endure extreme cold? ____
   A in the high regions
   B in the middle regions
   C in the lower regions
   D at the bottom

Answer the following two questions:

6. When do the leaves of deciduous trees fall? Why?
7. What do living things in deserts suffer from, that living things in lakes don't?

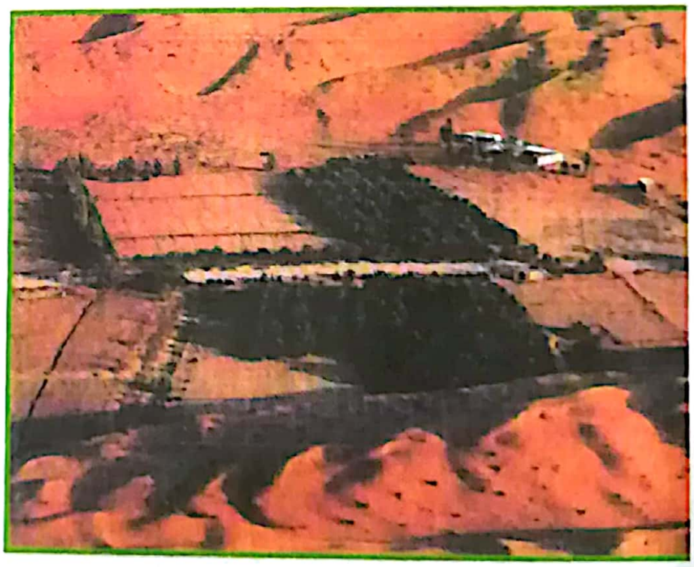
Process Skills Review

In lessons 1 and 3 you **made a model** of a desert environment and a pond environment. How did these models help you learn about the features of these environments?

Performance Assessment

Diagram an Ocean

Work with two or three other students. On a large sheet of paper, draw an ocean environment. Show its zones and label each. Then draw two kinds of animals that live in each zone.



CHAPTER

3

Living Things Depend on One Anothe

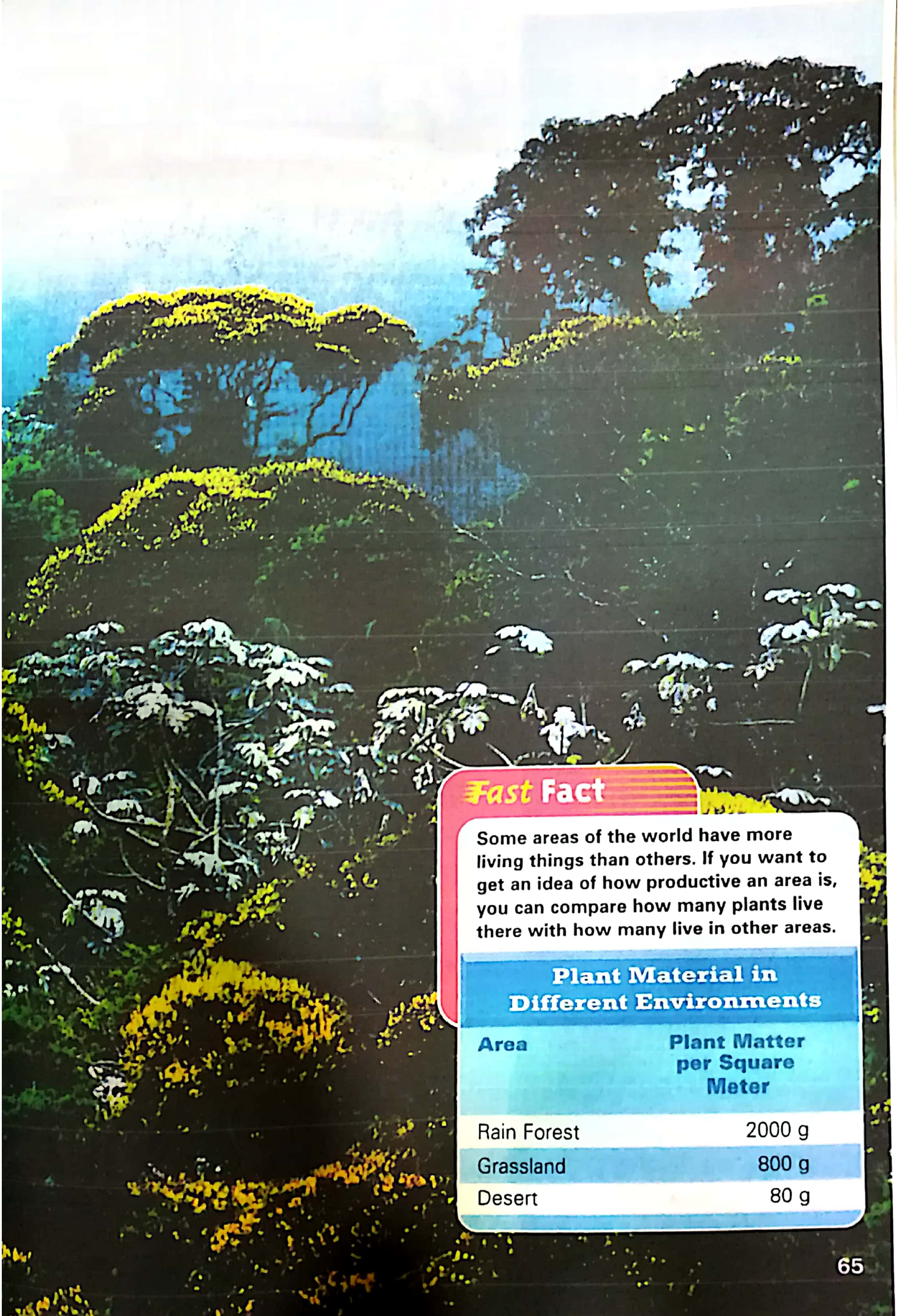
Vocabulary

- interact
- producer
- consumer
- herbivore
- carnivore
- omnivore
- decomposer
- food chain
- energy pyramid

Like all living things, you depend on plants and animals around you to meet your needs. You eat plants and animal products. You may use furniture made from wood. You wear clothes made from plant fibers. Plants and animals depend on one another to help them meet their needs.

Fast Fact

Hippopotamuses live in the rivers of central Africa. They eat grasses and other water plants. The wastes they produce are rich in nutrients, which help the plants to grow.



Fast Fact

Some areas of the world have more living things than others. If you want to get an idea of how productive an area is, you can compare how many plants live there with how many live in other areas.

Plant Material in Different Environments

Area	Plant Matter per Square Meter
Rain Forest	2000 g
Grassland	800 g
Desert	80 g

LESSON 1

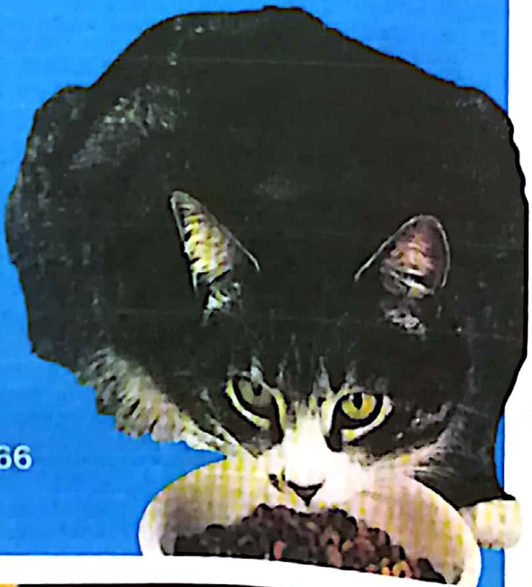
How Do Living Things Get Food?

In this lesson, you can . . .

INVESTIGATE how animals use their teeth to help them get food.

LEARN ABOUT how living things get food.

LINK SCIENCE to math and health.



Animals that are pets get their food from people. But animals that are wild must find their own food.

INVESTIGATE

Animal Teeth

Activity Purpose Bite into an apple. Which teeth do you use? Which teet do you use to chew the apple? In this investigation you will **observe** the shapes o teeth of different animals.

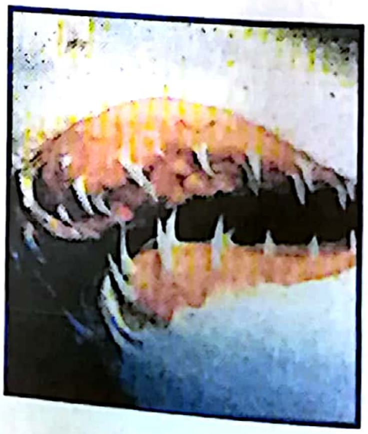
Materials

- blank index cards
- books about animals

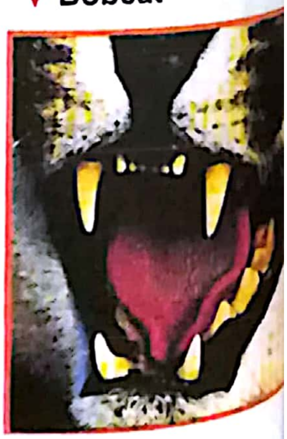
Activity Procedure

1. **Observe** the pictures of the animals. Look closely at the shape of each animal's teeth.
2. Use one index card for each animal. **Record** the animal's name, and draw the shape of its teeth.

Shark



Bobcat



3. With a partner, make a list of words that describe the teeth. **Record** these words next to the drawings on the index cards. (Picture A)

4. Think about the things each animal eats. Use books about animals if you need help. On the back of each index card, make a list of the things the animal eats.

Picture A

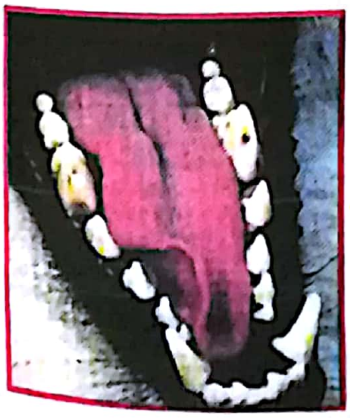
Draw Conclusions

1. Which animals might use their teeth to catch other animals? Which animals might use their teeth to eat plants? Explain.
2. Some animals use their teeth to help them do other things, too. **Observe** the beaver's teeth. How do its teeth help it cut down trees?
3. **Scientists at Work** Scientists learn by **observing.** Scientists can learn how animals use their teeth by watching how and what the animals eat. From what you observed in this investigation, what can you **infer** about the shapes of animals' teeth?

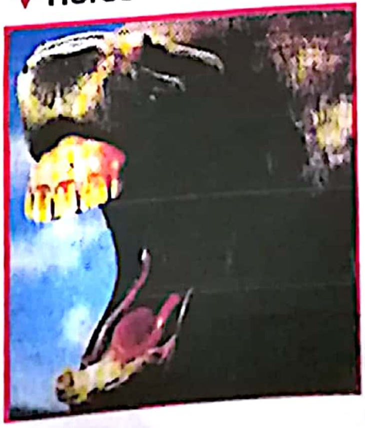
Process Skill Tip

Observing and inferring are not the same. When you **observe** , you use your senses. When you **infer**, you form an opinion using your observations.

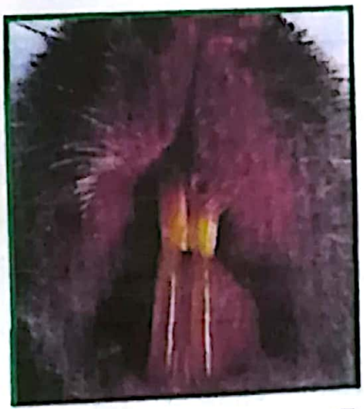
▼ **Wolf**



▼ **Horse**



▼ **Beaver**



LEARN ABOUT

Living Things and Food

FIND OUT
- how living things get food
- how plants and animals interact with the environment

VOCABULARY

interact
producer
consumer
herbivore
carnivore
omnivore
decomposer

Making and Getting Food

In the investigation you saw that animal's teeth match the food it eats. But not all living things have teeth. Some living things get their food in other ways. For example, a bird uses its beak to get food. Plants make their own food.

Plants and animals work together, or **interact**, with the environment to get what they need. Plants interact with sunlight, air, and water to make food. Animals interact with plants or other animals to get their food.

✓ **Why do plants and animals interact with the environment?**

▼ This strawberry plant uses energy from the sun to make its own food.

▼ This strawberry provides a chipmunk with some of the energy it needs to live.

▼ The chipmunk provides energy for a snake that catches and eats it.

Producers

Plants are producers. A **producer** is a living thing that makes its own food. Producers use the food they make to live and to grow.

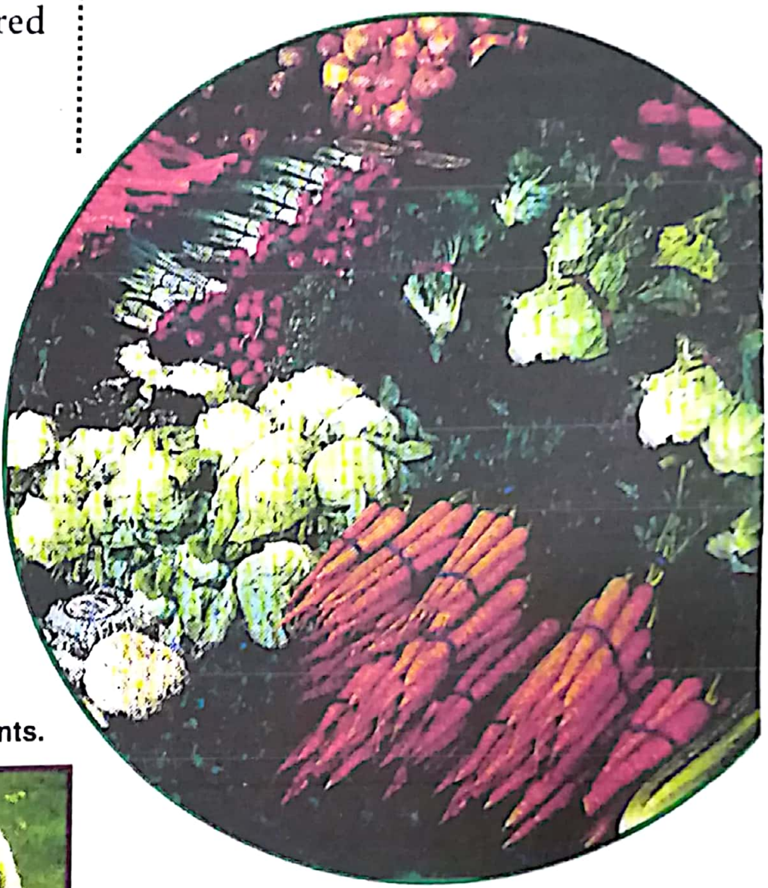
Plants make more food than they need. This extra food is stored in roots, leaves, seeds, and fruit. People and other animals then eat this stored food as their own food.

✓ **What is a producer?**

Consumers

Animals cannot make their own food. An animal is a consumer. A **consumer** is a living thing that eats other living things as food.

Some consumers eat only plants. These animals are **herbivores**. Sheep and goats are herbivores.



These foods come from plants. Plants are producers that make their own food. Animals then eat plants as food. ►

▼ A sheep is a consumer that eats plants.

A cow eating grass. ►

Some animals get food by eating other animals they hunt by themselves. These animals are **carnivores**. Animals that get food in this way have body parts that help them catch and eat their food. For example, a falcon has strong claws and a sharp beak.

Some animals, called **omnivores**, eat both plants and animals. A turtle eats both berries and insects.

✓ **What is a consumer?**

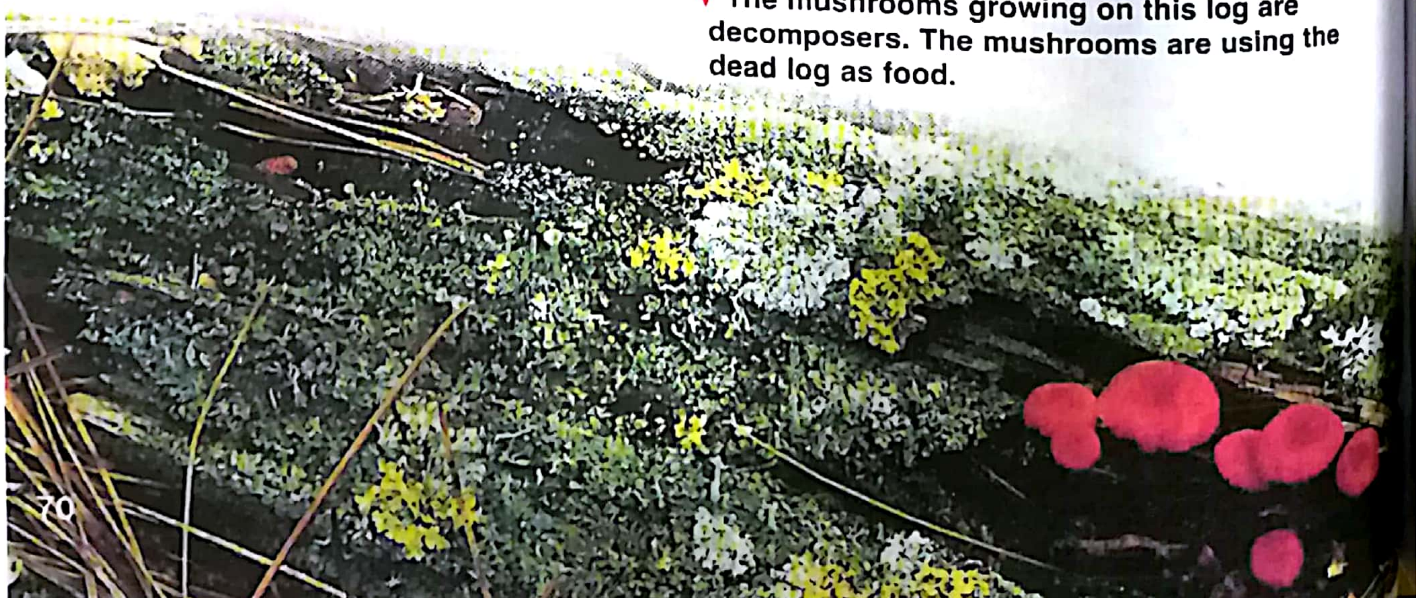
Decomposers

A **decomposer** is a living thing that breaks down dead things for food. Decomposers also break down the wastes of living things. As decomposers feed, they help clean the environment. Mushrooms, earthworms, and bacteria are decomposers.

✓ **What is a decomposer?**

▲ Many bacteria are decomposers.

This falcon catches small animals for its food. ▼



▼ The mushrooms growing on this log are decomposers. The mushrooms are using the dead log as food.

Summary

Plants and animals interact. They depend on their environments and on one another to get the food they need. Plants are producers. Animals are consumers. Decomposers get food by breaking down wastes or dead things.

Review

1. How do producers get their food?
2. How do consumers get their food?
3. What are the three groups of consumers?
4. How do decomposers help keep the environment clean?
5. **Test Prep** Which of the following is **NOT** a consumer?

   A bird
   B tree
   C squirrel
   D sheep

LINKS

MATH LINK

Solve a Problem

Scientists studied 9 mooses on an island. They found that during the summer, each moose eats the fruit of 25 blackberry bushes. What is the minimum number of blackberry bushes on the island?

HEALTH LINK

Teeth

Think about how you use your teeth to eat? Which teeth do the cutting? The chewing? How are the teeth different?

LESSON 2

What Are Food Chains?

In this lesson, you can . . .

INVESTIGATE a food-chain model.

LEARN ABOUT food chains and energy pyramids.

LINK SCIENCE to math and fine arts.

A puffin eats different kinds of sea animals. It can catch as many as ten small fish at one time in its beak.

INVESTIGATE

Make a Food Chain Model

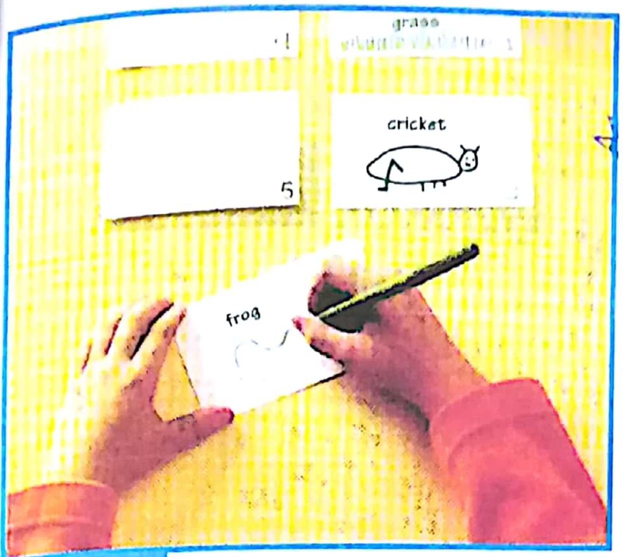
Activity Purpose You get energy from the food you eat. All living things get energy from the food they eat. In this investigation you will **use a model** to show how living things interact to get their energy from food.

Materials

- index cards
- marker
- 4 pieces of yarn or string
- tape

Activity Procedure

1. In the bottom right-hand corners, number the index cards 1 through 5.
2. On Card 1, draw and label grass. On Card 2, draw and label a cricket. On Card 3, draw and label a frog. On Card 4, draw and label a snake. On Card 5, draw and label a hawk. (Picture A)



Picture A

Picture B

3. Order the cards in a line with Card 1 first and Card 5 last. Use yarn and tape to connect the cards. (Picture B)

4. Stretch the connected cards out on a table. The cards form a model called a food chain.

5. Discuss with a classmate how each living thing in the food chain gets its food. Tell which things in your model show producers. Tell which things show consumers.

Draw Conclusions

1. In your model, which living thing is last in the food chain? Why do you think it is in this place?
2. In which part of the food chain is the producer found? Why do you think it is there?
3. **Scientists at Work** Scientists **use models** to help them study things in nature. How does using a model of a food chain help you understand living things and the food they eat?

Process Skill Tip

It is hard to **observe** a real-life food chain. **Using a model** of a food chain helps you learn about the real thing.

LEARN ABOUT

Food and Energy

FIND OUT

- how living things get energy
- how energy moves through a food chain

VOCABULARY

food chain
energy pyramid

Food Chains

All living things need energy to live. Producers get energy from sunlight. They store the energy in the food they make. Consumers get their food by eating other living things.

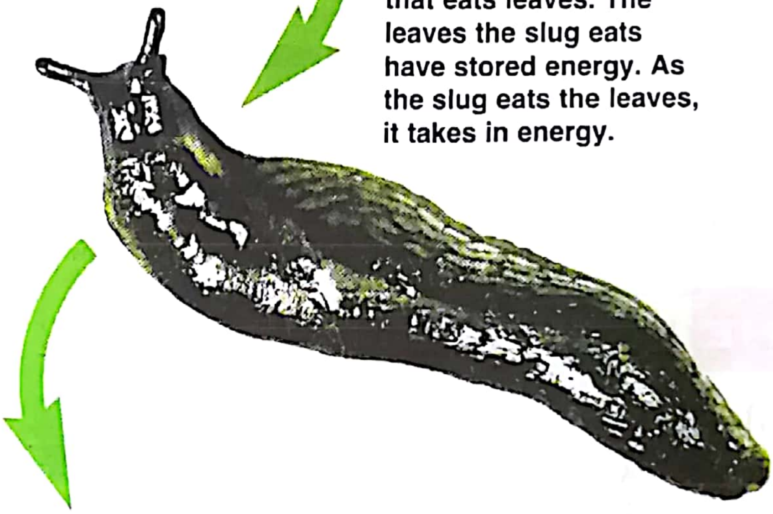
In the investigation you saw that the path of food from one living thing to another forms a **food chain**. A food chain also shows how energy moves through the environment. For example, grass uses the energy in sunlight to make its food. A cricket that eats the grass gets the energy stored in the grass. If a frog eats the cricket, it gets the energy that is stored in the cricket.

✓ **What is a food chain?**

This turtle eats slugs that eat leaves. ►

A Food Chain

All plants are producers. The leaves of plants make food by photosynthesis. The plant stores the extra food it makes. This stored food has energy in it.



A slug is a consumer that eats leaves. The leaves the slug eats have stored energy. As the slug eats the leaves, it takes in energy.

This turtle is a consumer too. One of the foods it eats is slugs. When the turtle eats a slug, it takes in energy.

Energy from Food

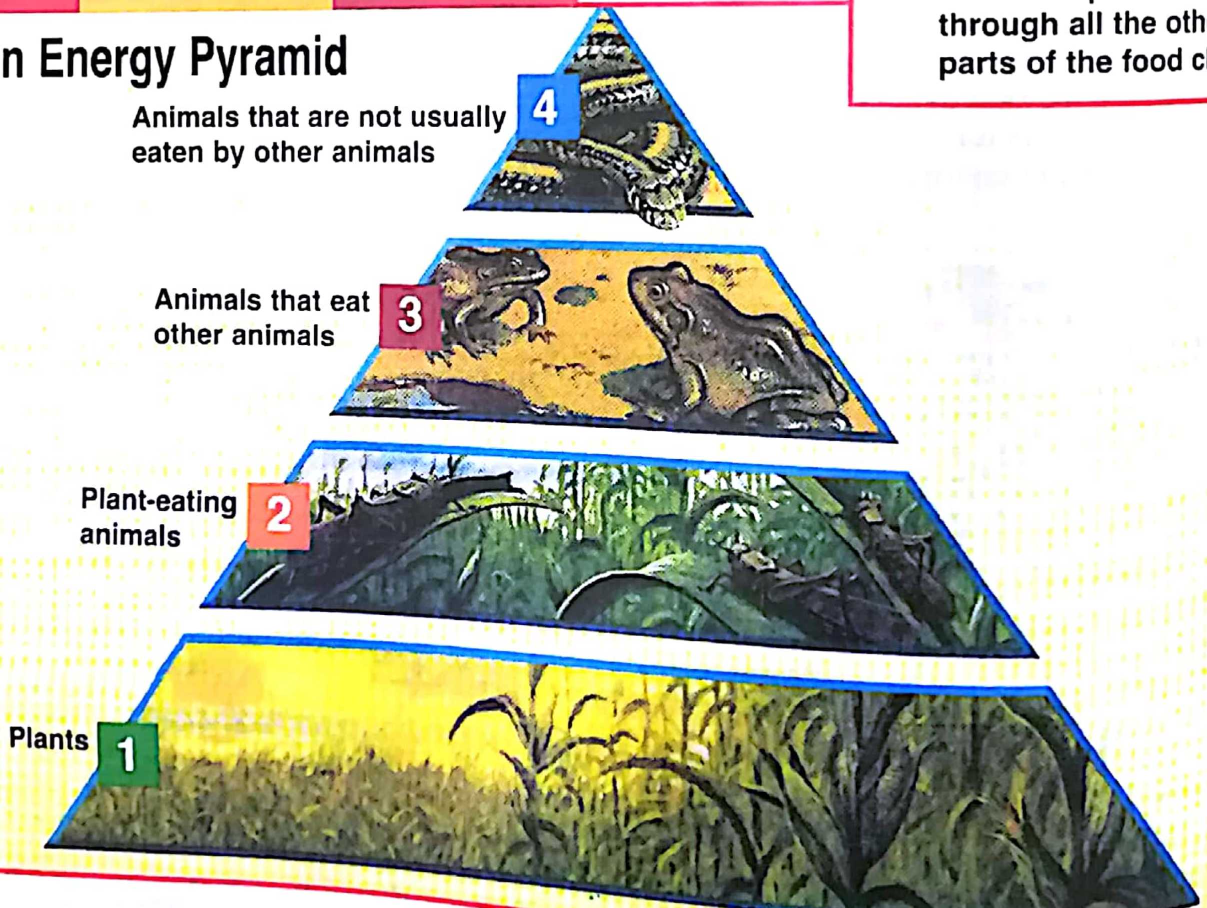
The energy that a living thing uses to live and grow cannot be passed along through the food chain. An **energy pyramid** shows that the amount of usable energy in an environment is less for each higher animal in the food chain.

In an energy pyramid, there are more producers than any other kind of living things. Most of the energy in an environment is found in plants. Animals that eat plants make up the next level. The upper parts of the pyramid are made up of animals that eat other animals. The higher in the pyramid an animal is, the fewer of that animal there are. This is because there is less energy available to them.

✓ **What is an energy pyramid?**

THE INSIDE STORY

An Energy Pyramid


Animals that are not usually eaten by other animals
4
Animals that eat other animals
3
Plant-eating animals
2
Plants
1

1 Energy from the sun is taken in by plants. This energy is used by plants for growth and to make fruits and seeds. Energy that is not used by the plant is stored.

2 Animals that eat plants are called first-level consumers. Energy not used by the animal is stored in its body.

3 Animals that eat other animals are called second-level consumers. Some of the energy stored in first-level consumers can be passed on to these animals.

4 The energy these top-level consumers get has been passed through all the other parts of the food chain.

A hyena is a *scavenger*, an animal that feeds on dead animals.

Summary

Living things get their energy from food. Animals cannot make their own food, so they eat other living things to get energy. A food chain is the flow of food in an environment from one living thing to another. An energy pyramid shows that the amount of usable energy in an environment is less for each higher animal in the pyramid.

Review

1. How does energy get from a producer to a meat-eating consumer?
2. What kind of living thing is at the top of a food chain?
3. Where is the most food energy in an energy pyramid found?
4. What is the source of all energy on Earth?
5. **Test Prep** What is passed in a food chain from one living thing to another?

A producers
B sunlight
C animals
D energy

LINKS

MATH LINK

Count Fractions

One food chain is made up of a producer, a consumer that eats plants, a consumer that eats both plants and animals, and a consumer that eats only animals. What is the number of living things in this food chain? How many of these living things eat plants?

FINE ARTS LINK

Food Chains

Your lunch meals vary. They might include bread, rice chicken, vegetables, meat, or fish. Draw three food chains with you as part of all three of them.

CHAPTER 3 Review and Test Preparation

Vocabulary Review

Use the terms below to complete the sentences 1 through 9. The page numbers in ( ) tell you where to look in the chapter if you need help.

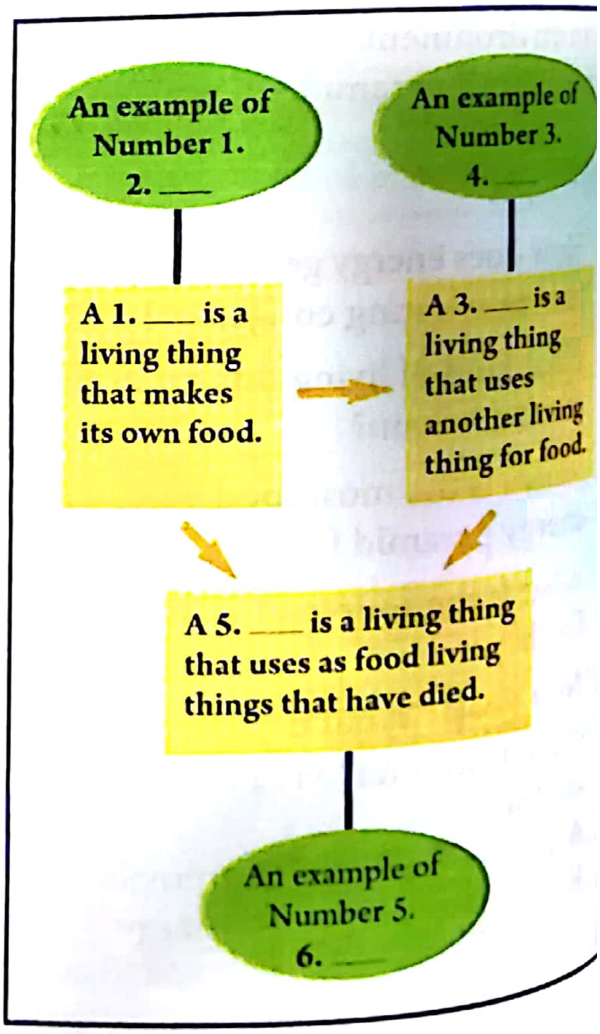
interact (68)
producer (69)
consumer (69)
herbivore (69)
carnivore (70)
omnivore (70)
decomposer (70)
food chain (74)
energy pyramid (76)

1. A ____ feeds on the wastes of other living things.
2. The path of food in an ecosystem can be shown as a ____ .
3. A ____ makes its own food.
4. A living thing that eats other living things is called a ____ .
5. Consumers that eat both plants and animals are ____ .
6. The living things in a community ____ with each other and with nonliving things.
7. Consumers that eat only plants are ____ .
8. A model of how energy moves through a food chain is called an ____ .
9. Consumers that eat only animals are ____ .

Connect Concepts

Use the terms from the Word Bank to complete the concept map.

consumer
decomposer
grass
horse
mushroom
producer



An example of Number 1.
2. ____
An example of Number 3.
4. ____
A 1. ____ is a living thing that makes its own food.
A 3. ____ is a living thing that uses another living thing for food.
A 5. ____ is a living thing that uses as food living things that have died.
An example of Number 5.
6. ____

Check Understanding

Write the letter of the best choice.

1. Which is **NOT** a producer? ____
   A tree
   B flower
   C grass
   D bird

2. A model that shows how energy moves through a food chain is ____
   A a decomposer
   B an energy pyramid
   C an environment
   D a producer

3. Producers get their energy from ____
   A other living things
   B an energy pyramid
   C the soil
   D the sun

Answer the following two questions:

4. Explain how a carnivore wolf is dependent on plants.
5. What will change in the following food chain if the number of falcons decreased due to overhunting?
   Grains → Mouse → Falcon

Process Skills Review

1. How can you use **observation** to find out what a goat eats? How might you **infer** what the goat eats?
2. Use what you know about **models** to draw a food chain that includes grains, a mouse, a snake, and a hawk.

Performance Assessment

Diagram a Food Chain

Work with a partner. Choose an animal with which you are familiar. Draw a food chain that includes the animal. Identify the producer and the consumer in this food chain.

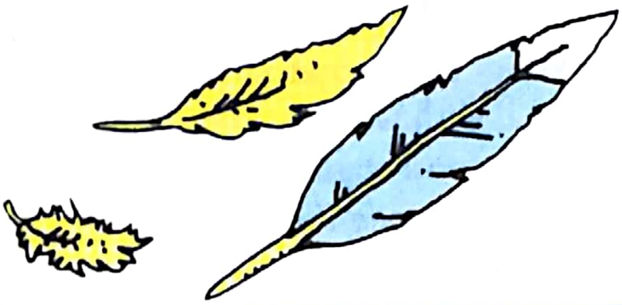
ACTIVITIES FOR HOME OR SCHOOL

FEATHER STUDY

What are the parts of feathers?

Materials

- 1or 2 types of feathers from a bird
- hand lens



Procedure

① Study the feathers. Use the hand lens to look at their parts. Record what you observe.

② Touch the feathers as you look at them. Record what you feel.

Draw Conclusions

Discuss what you know about birds. Think of ways the feathers help birds fly.

FOOD CHAINS

How do animals get their food?

Materials

- name tags
- colored game markers
- small plastic bags

Procedure

Play this game with ten or more people.

① Have each player wear a tag that names him or her as a grasshopper, a snake, or a hawk. Scatter the game markers over a large area. The game markers are the food.

② Each round of the game is 30 seconds. In the first round, only grasshoppers play. They collect as many markers as they can and put them in their bags.

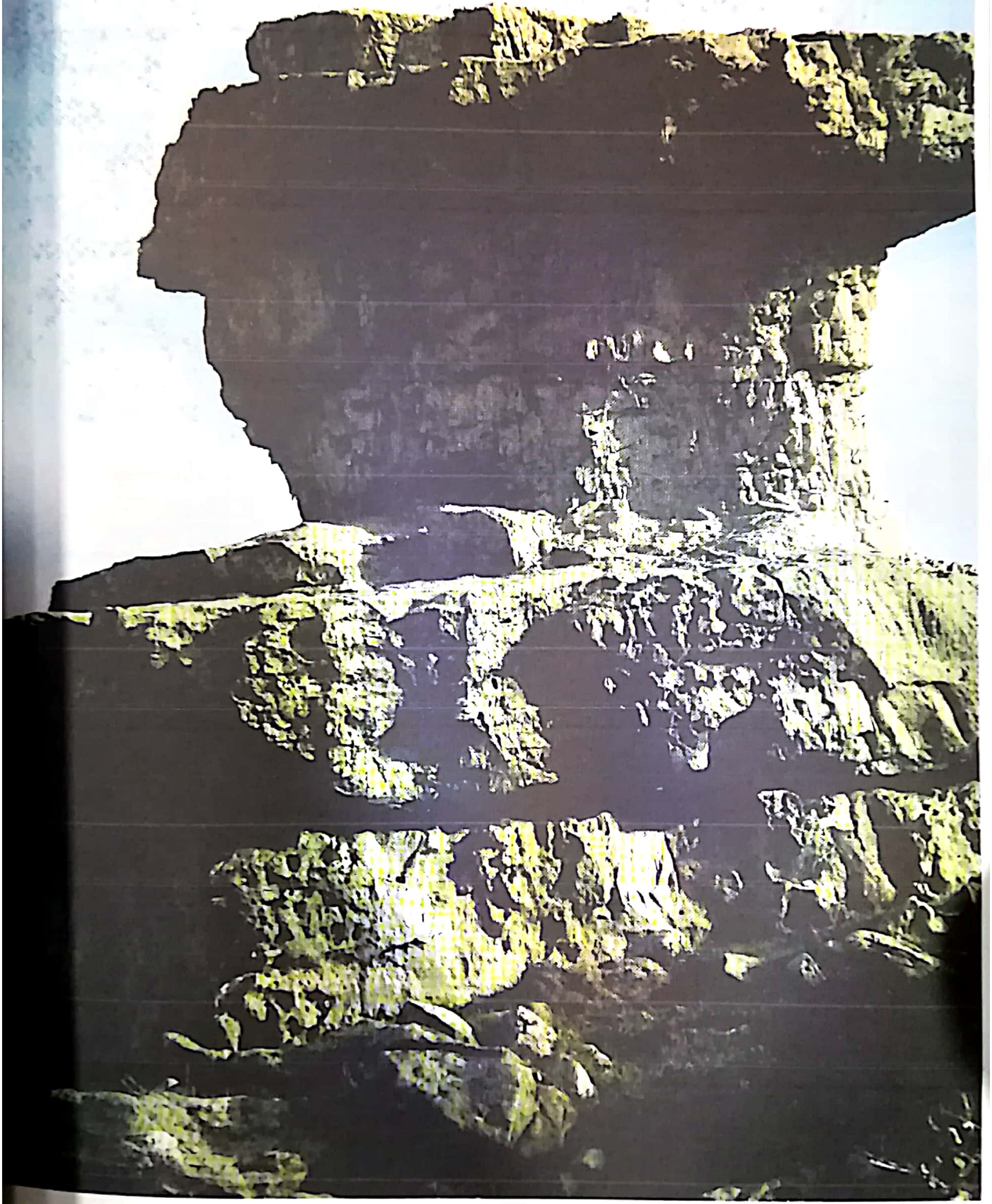
③ In the next round, only snakes play.

④ In the final round, only hawks play.

Draw Conclusions

Which animals have the most food after three rounds? Explain your answer.

Earth Science



UNIT 2 EARTH SCIENCE

CHAPTER 1 Minerals and Rocks 84
CHAPTER 2 Water 102
CHAPTER 3 The Movement of Objects in the Solar System 122
Activities for Home or School 140

UNIT EXPERIMENT

The Depth of Ponds and Evaporation

Sunlight heats liquid water and causes it to evaporate and rise into the air as water vapor. As you study this unit, you can conduct a long-term experiment to find out how the depth of a pond affects the transfer of water to the air. Here is a question to think about. Does water in a deep pond evaporate faster than water in a shallow pond? Plan and conduct an experiment to find answers to this or other questions that you may have about evaporation.

CHAPTER

1

Minerals and Rocks

Take a look at rocks around you. Some may be on the ground. Others may have been used to build homes and commercial buildings. Some rocks are shiny. Others may have different-colored pieces in them.

Vocabulary

- mineral
- rock
- crust
- mantle
- core
- igneous rock
- sedimentary rock
- metamorphic rock
- rock cycle

Fast Fact

If lightning strikes a sandy beach, a new kind of rock may form. The heat from the lightning causes the sand to melt and a glassy rock called fulgurite is formed.

Fast Fact

Lava can destroy everything in its path. How hot is lava? its color can give you a clue. The brighter the color, the hotter the lava.

Lava Temperatures

Color	Degrees C
Yellow-white	1250
Orange	1075
Bright red	900
Dark red	725
Brown-red	575

LESSON 1

What Are Minerals and Rocks?

In this lesson, you can . . .

INVESTIGATE the hardness of minerals.

LEARN ABOUT minerals and Earth layers.

LINK SCIENCE to math and social studies.

INVESTIGATE

Testing Minerals

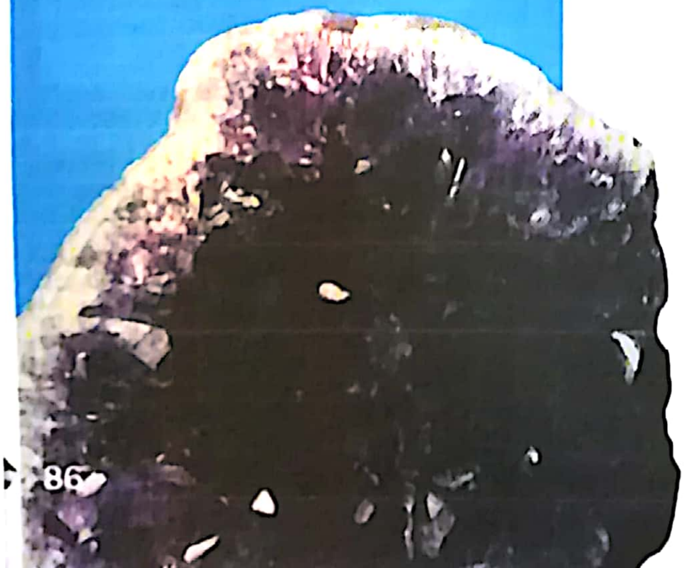
Activity Purpose How do scientists tell minerals apart? They test them for specific properties. A property is a feature that identifies something. In this investigation you will test seven minerals for the property of hardness. Then you will **order** the minerals from softest to hardest.

Materials

- minerals labeled A through G

Activity Procedure

1. A harder mineral scratches a softer mineral. Try to scratch each of the other minerals with Sample A. **Record** which minerals Sample A scratches. (Picture A)
2. A softer mineral is scratched by a harder mineral. Try to scratch Sample A with each of the other minerals. **Record** which minerals scratch Sample A.

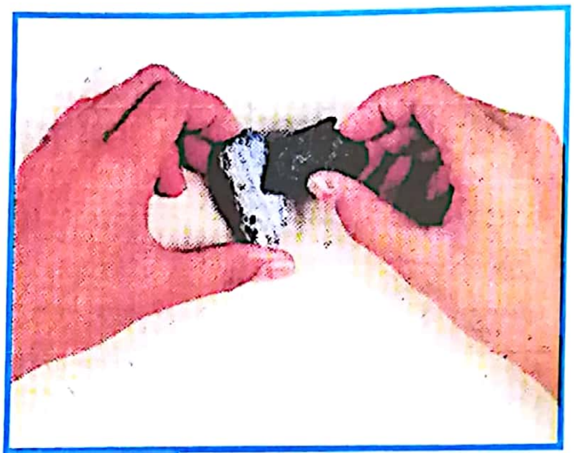


◄ A geode is a hollow rounded rock with mineral crystals inside.

Mineral to Test	Minerals That Scratch It	Minerals It Scratches
Sample A		
Sample B		
Sample C		
Sample D		
Sample E		
Sample F		
Sample G		

③ Repeat steps 1 and 2 for each mineral.

④ Using the information in your chart, **order** the minerals from softest to hardest. Give each mineral a number, starting with 1 for the softest mineral.


Picture A

Draw Conclusions

1. Which mineral was the hardest? Which was the softest? How do you know?
2. How did you decide the **order** of the minerals?
3. **Scientists at Work** Scientists often put objects in **order**. How can putting minerals in order of hardness help you identify them?

Process Skill Tip

In a scratch test, you **observe** the results and **record** them on a chart. You use the chart to put the objects in **order**.

LEARN ABOUT

Minerals and Rocks

FIND OUT

- what minerals are and how they are used
- what rocks are
- what is under the surface of the Earth

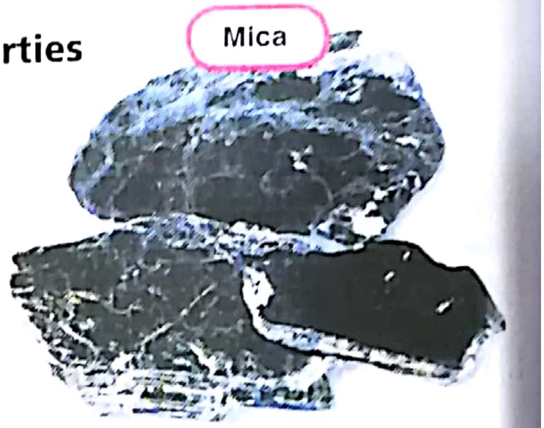
VOCABULARY

mineral
rock
crust
mantle
core

What Are Minerals?

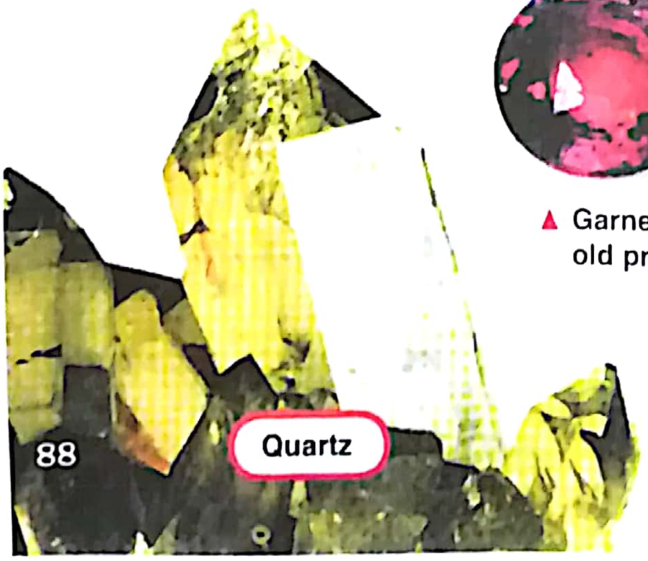
If an object is a solid, was formed in nature, and has never been alive, it's likely to be a **mineral**. There are many kinds of minerals. No two are exactly alike. Gold, for example, is shiny, common salt is light-colored, diamonds are the hardest minerals and are used for cutting glass, and chalk is so soft that you can write with it.

✓ **Name three properties of minerals.**



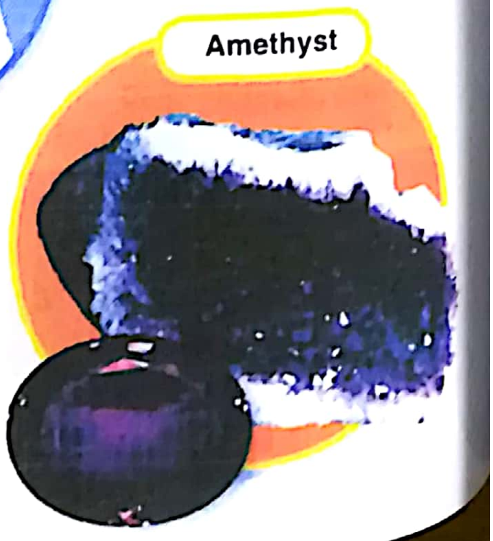
Mica is used in cosmetics and toothpaste. ►

▼ Quartz is used to make glass. Sand is commonly composed of quartz.



▲ Garnet is one of the old precious stones

▼ Amethyst is a deep purple variety of quartz. It is used in making jewellery. Ancient Egyptians believed that carrying this mineral protects from dangers.

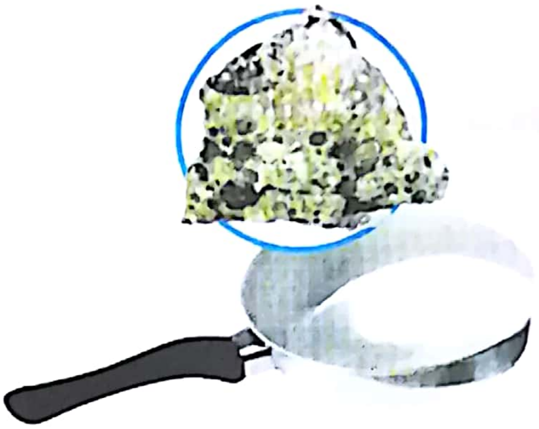


How Minerals Are Used

You use a mineral whenever you put salt on your food, or when you write with a pencil. The "lead" in the pencil is the mineral graphite.

Minerals are in many of the things around you. Iron is used to make bridges, buildings, and cars. Minerals such as gold and diamond are used to make jewellery. Quartz is used to make glass

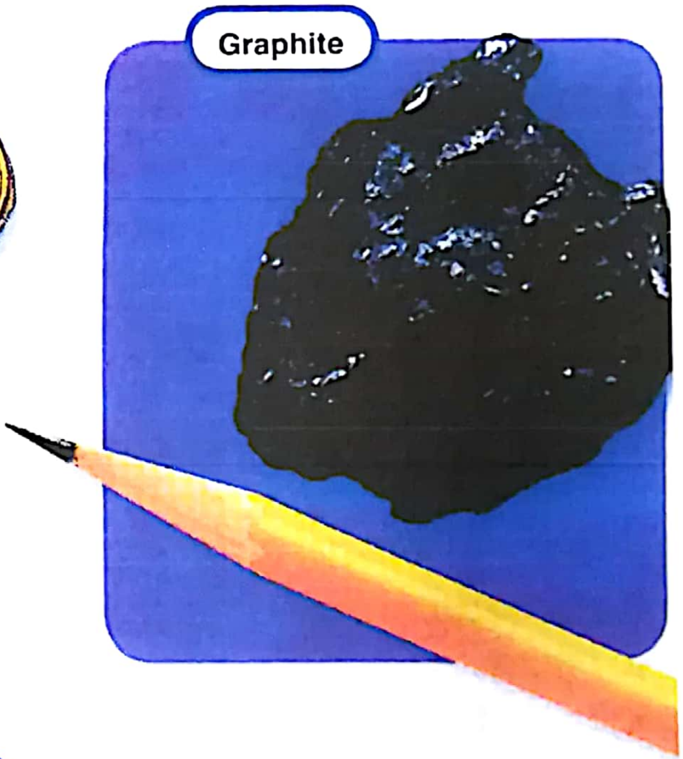
✓ **Name three ways minerals are used.**



▲ Aluminum comes from the mineral bauxite. Aluminum is molded into many products such as household utensils. and airplanes.

▼ In addition to its use in jewellery, gold is used in minting valuable coins. The picture below shows old Kurdistany golden coins.

▼ Graphite is used in making pencils.



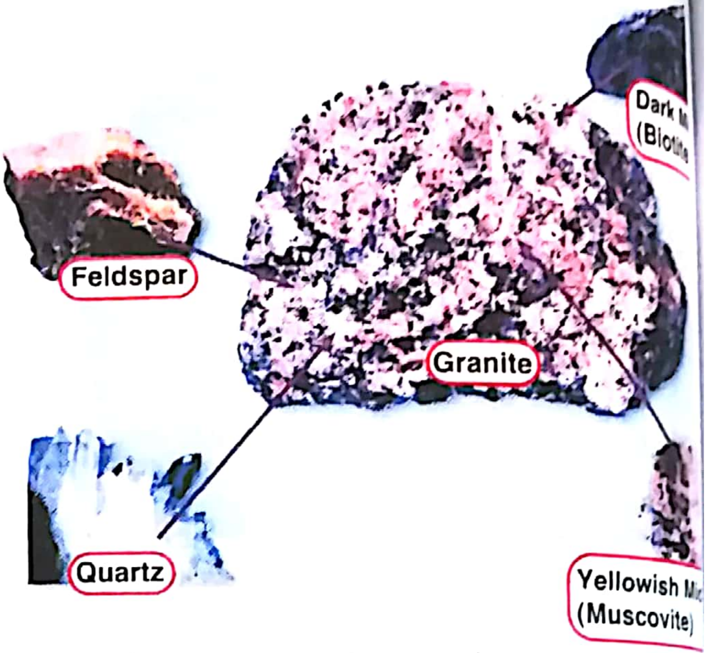
▼ Table salt is small crystals of the mineral halite.

What Are Rocks?

Earth's surface is made mostly of rocks. A **rock** is made of minerals. Some rocks are made of just one mineral. Other rocks are made of many minerals.

Granite rock is made of several minerals, while sandstone is made of small particles of the mineral quartz.

✓ **What are rocks made of?**



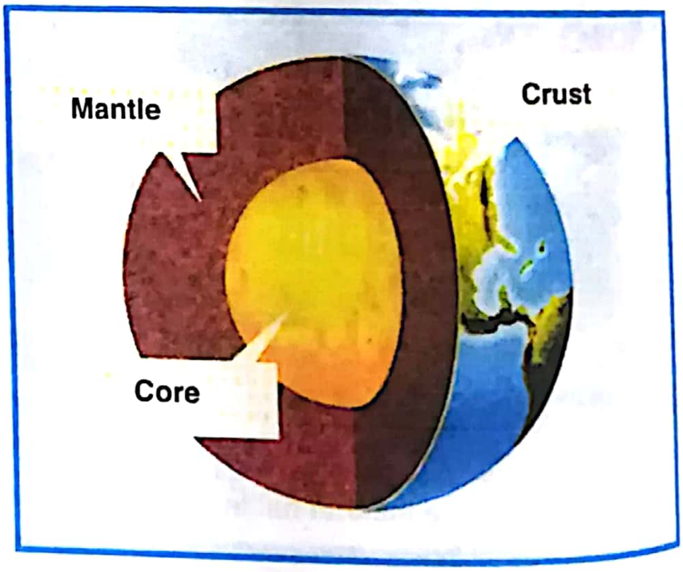
▲ Granite is made up of many minerals, mainly feldspar, quartz, and the two types of mica, the dark biotite and the yellowish muscovite.

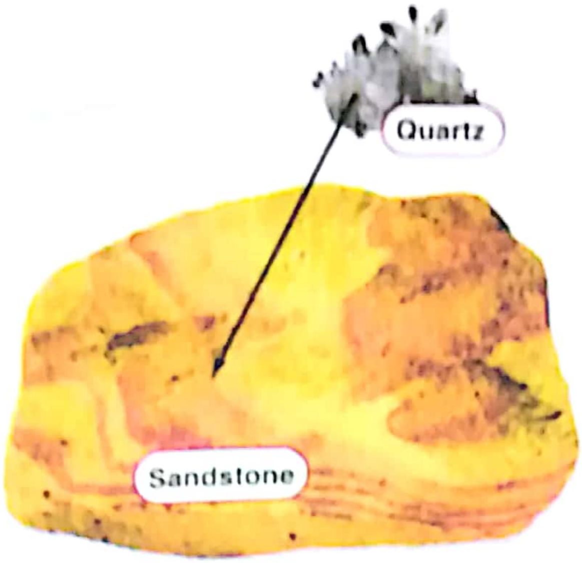
Layers of Earth

If you could cut away a section of the Earth, you would see three different layers of rocks. The outer solid layer is called the **crust**. It is the hard layer we live on and can see.

The crust sits on the **mantle**, the middle layer of Earth. The mantle is so hot that some of the rocks melt.

Below the mantle, at the center of the Earth, is the **core**. It is even hotter than the mantle.





▲ Sandstone is made of small particles of the mineral quartz.

Summary

A mineral is a solid that is formed in nature, and has never been alive. Rocks are made of one or several minerals. The Earth has three layers.

Review

1. What is a mineral?
2. What is a rock?
3. Describe the layers of the Earth.
4. What is the difference between the mantle and the crust?
5. **Test Prep** Which of these minerals is the hardest?

A quartz	C granite
B diamond	D sulphur

LINKS

MATH LINK

Geometrical Shapes
The particles in minerals form geometric patterns called crystals. Crystals have seven geometric shapes. Gather information on crystal shapes, to see how they are alike, and how they are different.

SOCIAL STUDIES LINK

Preparing a List of Minerals
Use the library or the Internet to research minerals in Kurdistan region.

Various rocks and minerals in Kurdistan

LESSON 2

How Do Rocks Form?

In this lesson, you can . . .

INVESTIGATE different types of rock.

LEARN ABOUT how rocks form, and their uses.

LINK SCIENCE to math and writing.

INVESTIGATE

Types of Rocks

Activity Purpose In this investigation you will **observe** six different rocks and **compare** their properties. Then you will use your observations to group the rocks.

Materials

- 3 rocks labeled *I*, *S*, and *M*
- hand lens
- 3 unknown rocks labeled *1*, *2*, and *3*

Activity Procedure

① Rocks *I*, *S*, and *M* are three different types of rocks. **Observe** them with and without the hand lens. **Record** your observations in the chart.

◄ For hundreds of years, nations have built fortresses and castles using rocks. Here is the Khanzad castle in Suran.

Rock	Observations
I	
S	
M	
1	
2	
3	

Picture A

② Observe the numbered rocks 1, 2, 3 with a hand lens. Then observe them without the hand lens. **Record** your observations in the chart. (Picture A)

③ **Compare** the properties of the lettered rocks with the properties of the numbered rocks. Think about how the rocks are alike and how they are different.

Process Skill Tip

When you **compare** objects, you **observe** their properties to find out how the objects are alike and how they are different. Comparing can help you put things into groups.

Draw Conclusions

1. What properties did you use to **compare** the rocks?
2. Which numbered rock is most like rock *I* ? Which numbered rock is most like rock *S* ? Which numbered rock is most like rock *M* ? Explain your answers.
3. **Scientists at Work** Scientists learn about new objects when they **compare** them with objects they have already studied. What did you learn about the rocks when you compared them?

LEARN ABOUT

How Rocks Form

FIND OUT

- how rocks form
- ways people use rocks to make things

VOCABULARY

igneous rock
sedimentary rock
metamorphic rock
rock cycle

Three Types of Rocks

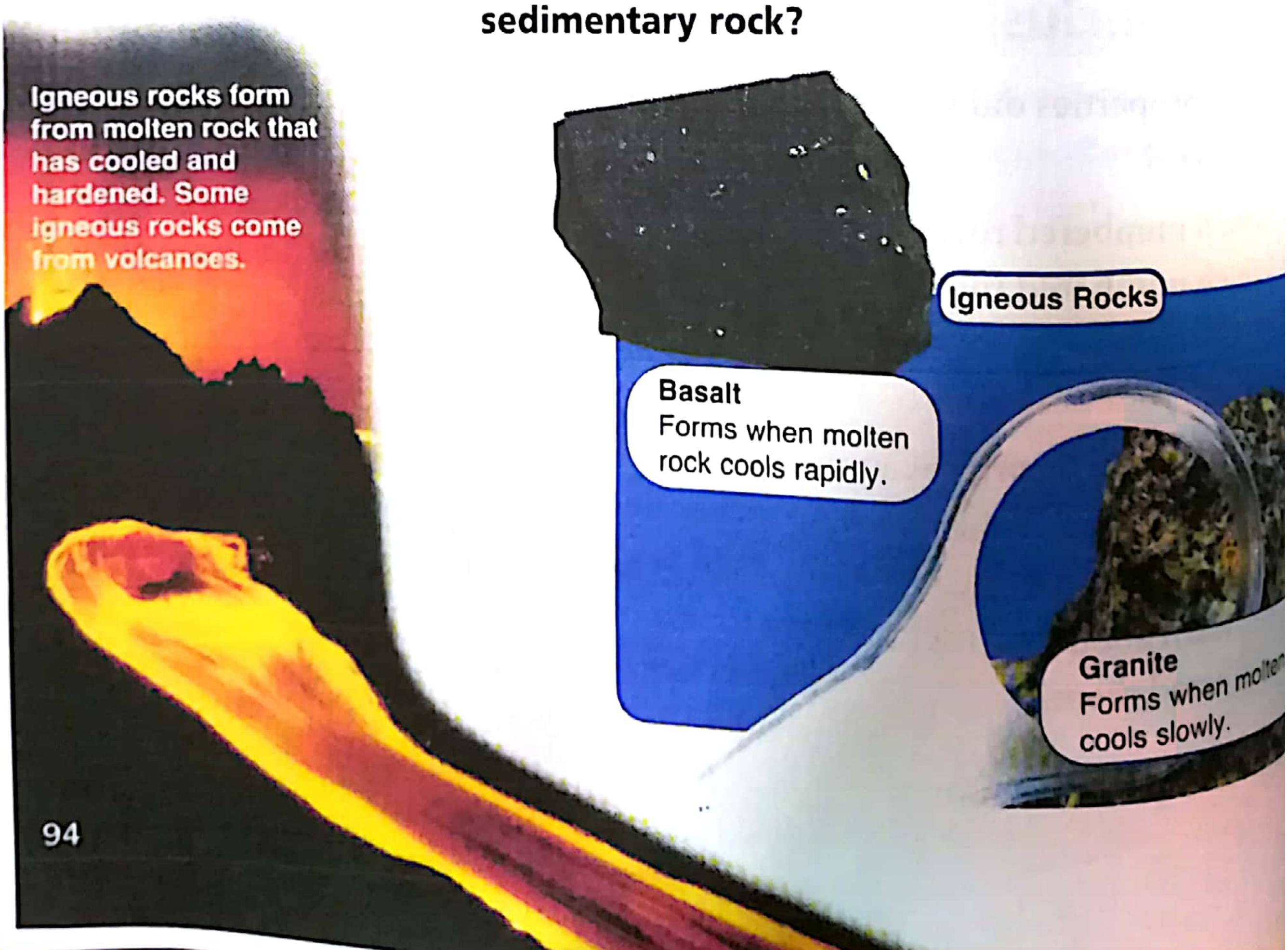
Rocks have not formed in one way, they have formed in three ways. Therefore rocks are classified into three groups based on the way they have formed.

Igneous rock is rock that was once melted then cooled and hardened.

Sedimentary rock is rock that formed from small rock particles, soil, and dead animals and plants, which accumulated, and became hard over time.

Metamorphic rock is rock that was exposed to great heat and pressure, and changed into new rock.

✓ **How does metamorphic rock differ from sedimentary rock?**

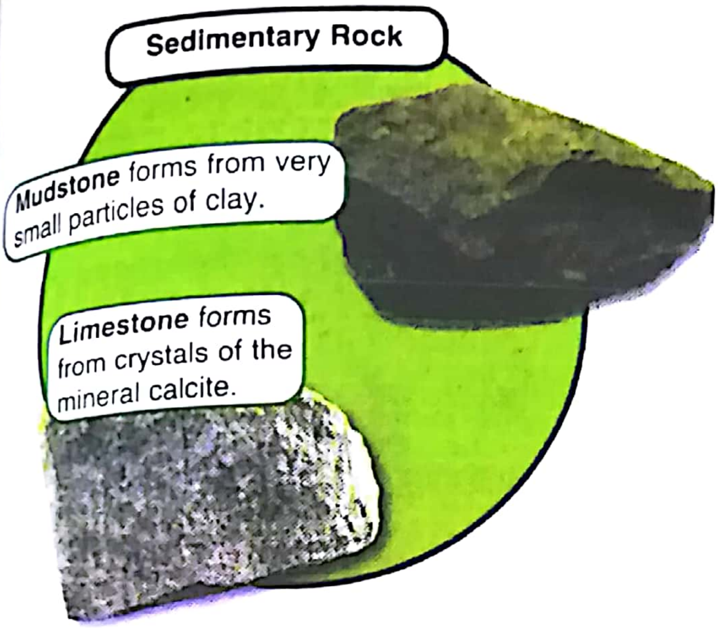


Igneous rocks form from molten rock that has cooled and hardened. Some igneous rocks come from volcanoes.

Igneous Rocks

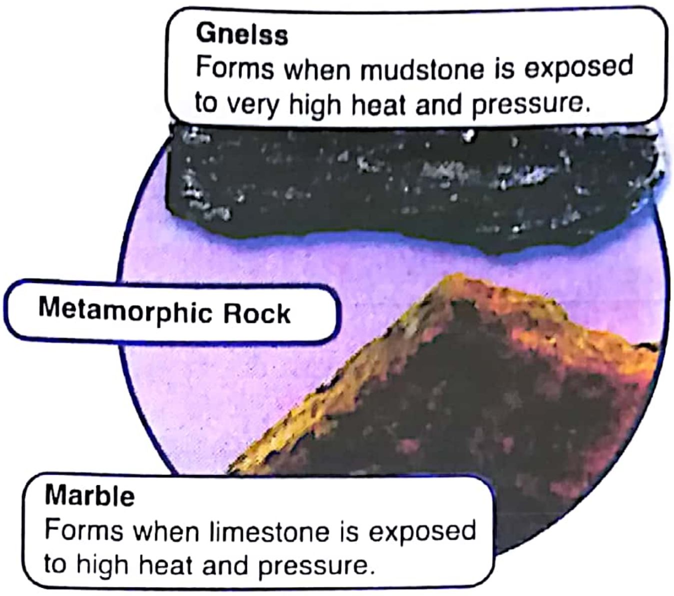
Basalt
Forms when molten rock cools rapidly.

Granite
Forms when molte
cools slowly.



Mudstone forms from very small particles of clay.

Limestone forms from crystals of the mineral calcite.



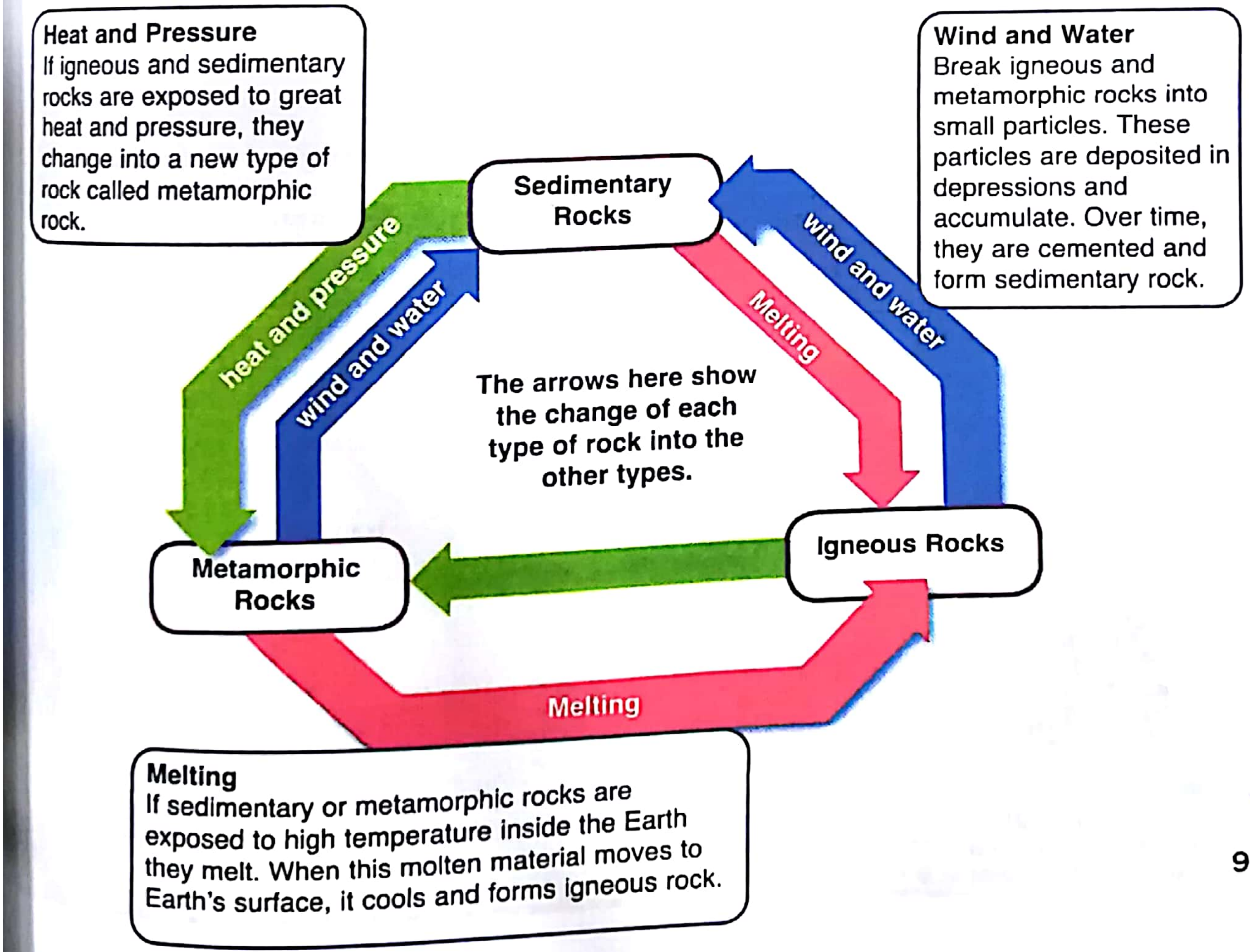
Gneiss
Forms when mudstone is exposed to very high heat and pressure.

Marble
Forms when limestone is exposed to high heat and pressure.

The Rock Cycle

You know that there are three types of rocks - igneous, metamorphic, and sedimentary. But did you know that each type of rock can be changed into the other types? This process of rocks changing from one type of rock into another is called the **rock cycle**.

✓ **What is the rock cycle?**



Heat and Pressure
If igneous and sedimentary rocks are exposed to great heat and pressure, they change into a new type of rock called metamorphic rock.

Wind and Water
Break igneous and metamorphic rocks into small particles. These particles are deposited in depressions and accumulate. Over time, they are cemented and form sedimentary rock.

The arrows here show the change of each type of rock into the other types.

Melting
If sedimentary or metamorphic rocks are exposed to high temperature inside the Earth they melt. When this molten material moves to Earth's surface, it cools and forms igneous rock.

THE INSIDE STORY

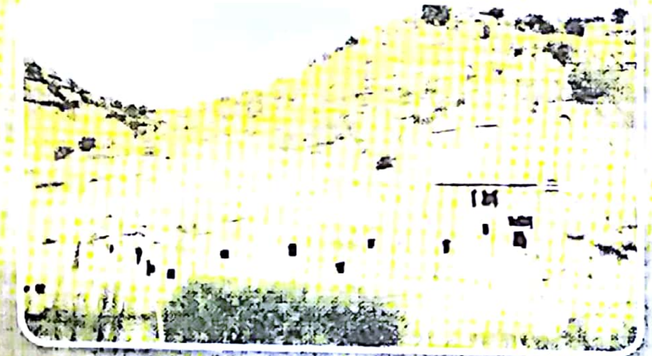
Rocks in Kurdistan Region

Sedimentary Rocks

Sedimentary rocks cover most areas of Kurdistan region. The most important sedimentary rocks in the region are:

- **Limestone Rocks:**

  They are the most common sedimentary rocks.



Khanas carvings remained to date because of the hardness of limestone rocks.

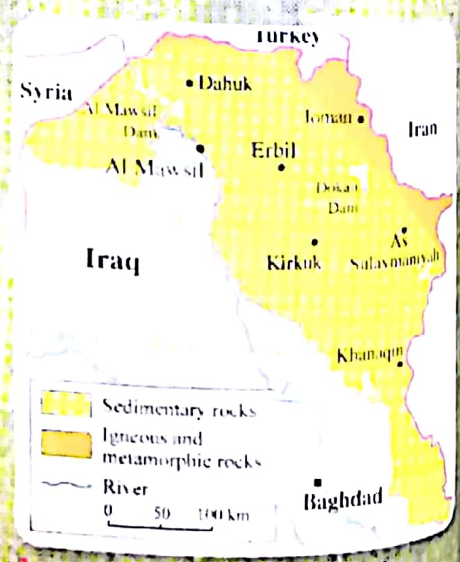
The cement factory near the town of Suleimaniyah uses limestone rocks in the production of cement .

- **Mudstone Rocks:**

  They are less common than sedimentary rocks.

Mudstone has been used in manufacturing bricks such as those which ornament the Muzafariyah minaret in Erbil.

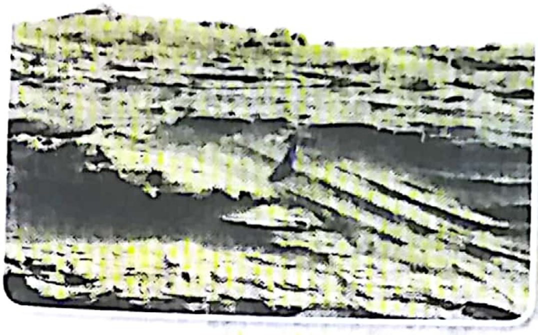
Mudstone rocks



A geologic map showing the types of rocks in Kurdistan.

- **Sandstone Rocks:**

They come third in coverage after mudstone. Other kinds of sedimentary rock are also found in the region such as conglomerates and siltstones



Sandstones. ▶

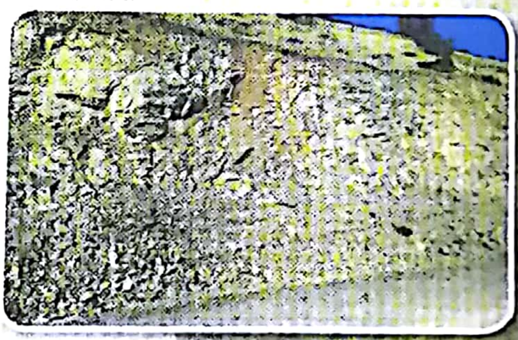
Igneous and Metamorphic Rocks

Igneous and metamorphic rocks are found in areas near Kurdistan's borders with Iran and Turkey.

▲ Granitic igneous rocks are found in Mawat.

▲ The use of metamorphic rocks in the city of Suleimaniyah.

▲ A marble quarry in Suleimaniyah governorate.



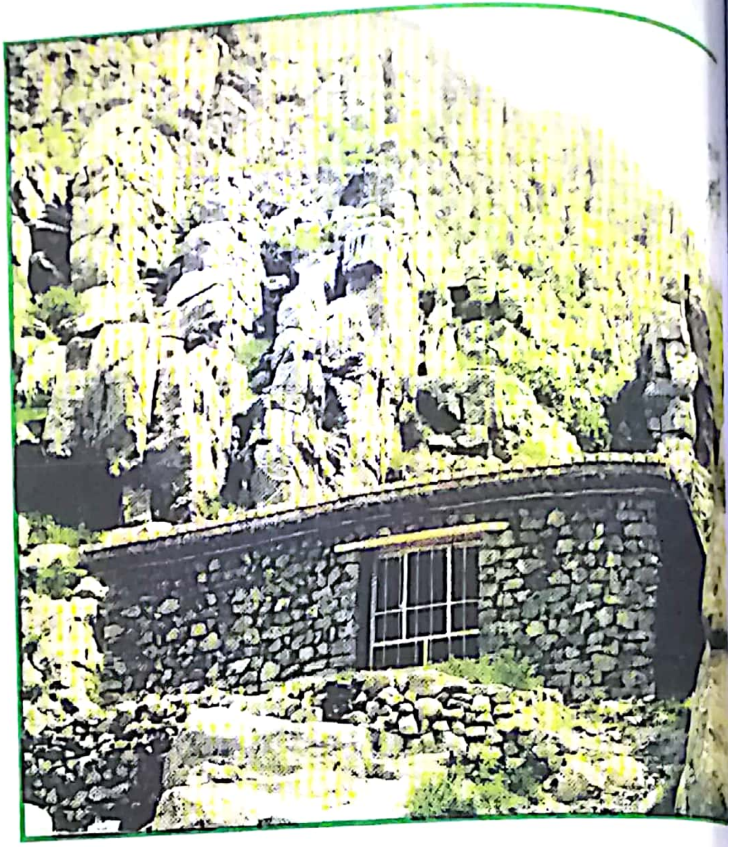
Basaltic igneous rocks near Konjrein.

◀ Those tiles are made in Kurdistan. The tile contains small fragments of metamorphic (green and white) and igneous (black) rocks quarried in eastern Kurdistan.

low People Use Rocks

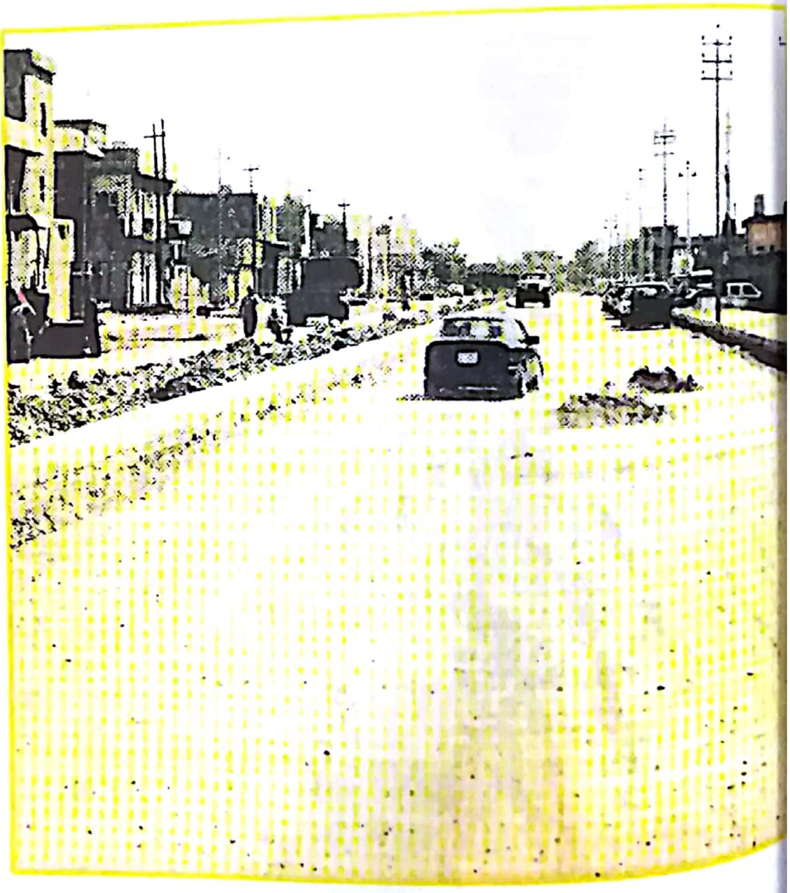
Colorful rocks are worn as wellery. Roads are paved with ocks, and many buildings and atues are made of rocks. Also lass is made of sandstone rock.

What are two uses of rocks?



A house built of rocks in the village of Serklo in the Suleimaniyah governorate. ►

▲ Rocks are also used in ornamentation. This mosaic is made of small pieces of rocks placed together in a beautiful pattern, to ornament the minaret of a mosque in Erbil.



▲ Using gravel to pave the roads.

Summary

There are three types of rocks: Igneous, sedimentary, and metamorphic. Igneous rocks form from melted rock that has cooled and hardened. Sedimentary rocks form from small rock particles and soil. Metamorphic rocks form by heat and pressure. The rock cycle shows how one type of rock can be changed into another type of rock. Rocks have various uses.

Review

1. How do igneous rocks form?
2. How can igneous rocks become sedimentary rocks?
3. How can metamorphic rocks become igneous rocks?
4. Choose one rock type and tell about its uses?
5. **Test Prep** Which type of rock forms from small rock particles, soil, and dead animals and plants?
   A igneous
   B metamorphic
   C sedimentary
   D all types of rocks

LINKS

MATH LINK

Solve a Problem
Suppose you were asked to make a model of the rock cycle. You were told to include in your model 3 types of each kind of rock. How many rocks are in the model?

WRITING LINK

Report
Visit a rock cutting factory, and interview it's director. Ask him about the types of rocks quarried in Kurdistan region, their names, and their uses. Write the information that you get in a report.

CHAPTER 1 Review and Test Preparation

Vocabulary Review

Use the terms below to complete the sentences 1 through 9. The page numbers in ( ) tell you where to look in the chapter if you need help.

mineral (88)
rock (90)
crust (90)
mantle (90)
core (90)
igneous rock (94)
sedimentary rock (94)
metamorphic rock (94)
rock cycle (95)

1. Rock that has been changed by heat and pressure in the Earth is ____ .
2. ____ is the very hot layer located below the mantle .
3. The solid material made of minerals is ____ .
4. A ____ is a solid, formed in nature, and has never been alive.
5. Rock that forms from small fragments of rock, soil and dead animals and plants is ____ .
6. The ____ is Earth's middle layer, and is so hot that some of the rock have nearly melted.
7. The change of one type of rock into another type is a process called the ____ .
8. The ____ is Earth's outer layer.
9. Melted rock that has cooled and hardened is ____ .

Connect Concepts

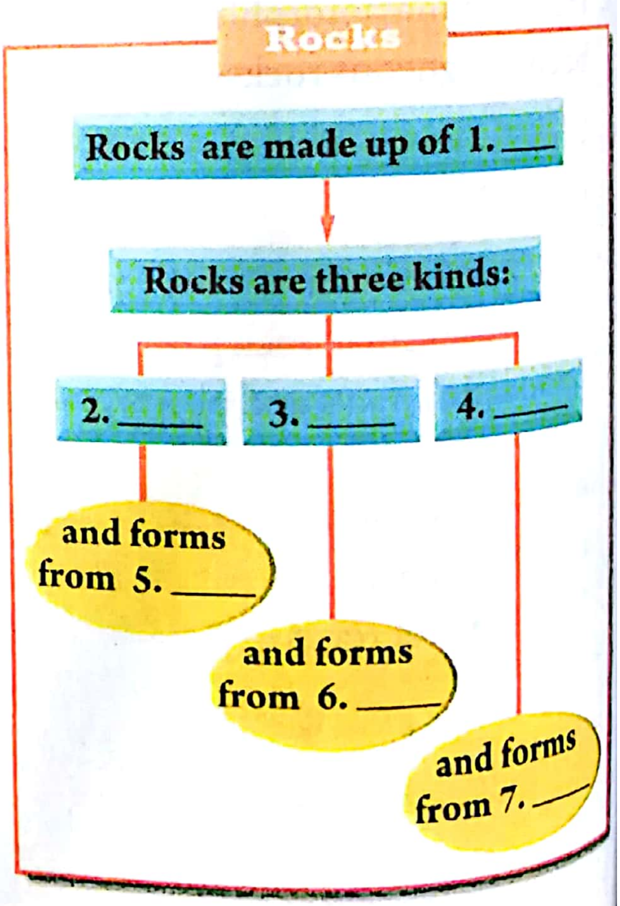
Use the terms from the Word Bank to complete the concept map.

minerals
igneous
sedimentary
metamorphic

rock that has been exposed to high heat and pressure.

fragments of rock, soil, and dead animals and plants.

melted rock that has cooled and hardened.



Check Understanding

Write the letter of the best choice.

1. Rock is made of ____
   - **A** living things only
   - **B** one or more minerals
   - **C** only two minerals
   - **D** minerals that are hard
2. Heat helps form ____
   - **A** igneous and metamorphic rocks
   - **B** sedimentary and metamorphic rocks
   - **C** only igneous rocks
   - **D** only metamorphic rocks

Answer the following questions:

3. List the distinctive properties of gold and diamond.
4. If you get two samples of an igneous rock, how would you know which is basalt and which is granite, using the property of color?

Process Skills Review

1. **Compare** between the composition of granite and the composition of sandstone.
2. You want to **compare** three unknown rocks with three known rocks. What properties would you use.

Performance Assessment

Changing Rocks

Choose a type of rock. Tell how it could move through the rock cycle by changing into different types of rocks. Draw a picture showing the stages your rock could go through.

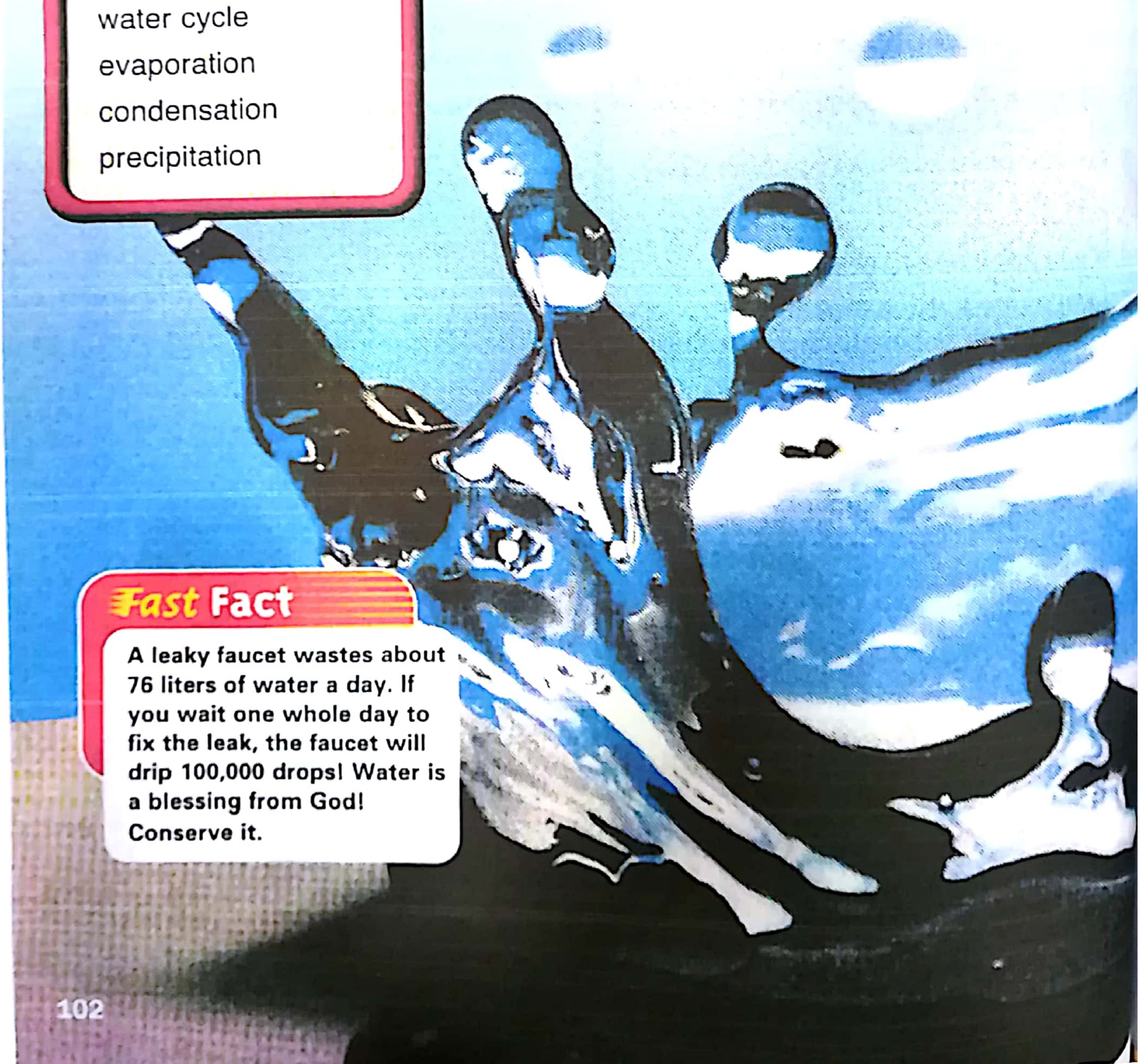
CHAPTER 2

Water

There's plenty of water on Earth. In fact, Earth is nearly covered with it. Most of the water on Earth is salty, but fresh water is mostly frozen. And even though water seems to be everywhere, in some places on Earth there is almost no water at all.

Vocabulary

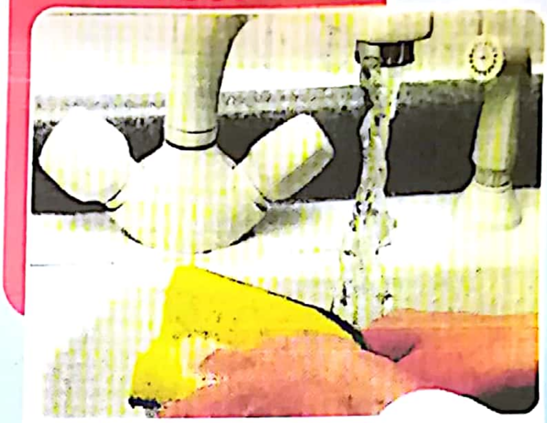
- groundwater
- water cycle
- evaporation
- condensation
- precipitation



Fast Fact

A leaky faucet wastes about 76 liters of water a day. If you wait one whole day to fix the leak, the faucet will drip 100,000 drops! Water is a blessing from God! Conserve it.

Fast Fact



Each person in Kurdistan region uses about 450 liters of water every day. In the USA, each person uses about 350 liters everyday. The table below shows the use of water in USA.

How Much Water

Activity	Liters
Brushing the teeth with the water running	23
Running a dishwasher	45
Bathing	95
Washing a load of laundry	190

Fast Fact

It takes 159,000 liters of water to prepare food from plants and animals for eight people. If we calculate the amount of water that has been used by these animals and plants since their existence and until their preparation for food, this amount is enough to fill a swimming pool!

LESSON 1

Where Is Water Found on Earth?

In this lesson, you can . . .

INVESTIGATE how much water covers Earth's surface.

LEARN ABOUT water on Earth.

LINK SCIENCE to math and fine arts.

INVESTIGATE

Land or Water

Activity Purpose Does Earth's surface have more land or more water? In this investigation you will play a game to **collect data** about Earth's surface. Then you will **use numbers** to estimate the amount of water on Earth's surface.

Materials

- plastic inflatable globe

Activity Procedure

1. Work in groups of five. Choose one person to **record** the results. The other four people will toss the ball.
2. Have the four ball tossers stand in a circle. The one who **records** the results hands the ball to the first person, who gently tosses the ball to another person in the circle. (Picture A)

◄ If you live in a cold place, you may see water in the form of snow.

③ The catcher should catch the ball with open hands. The person who **records** results checks to see if the tip of the catcher's right index finger is on land or water. The recorder should **record** this data.

Picture A

④ Continue tossing and recording until the ball has been tossed 20 times.

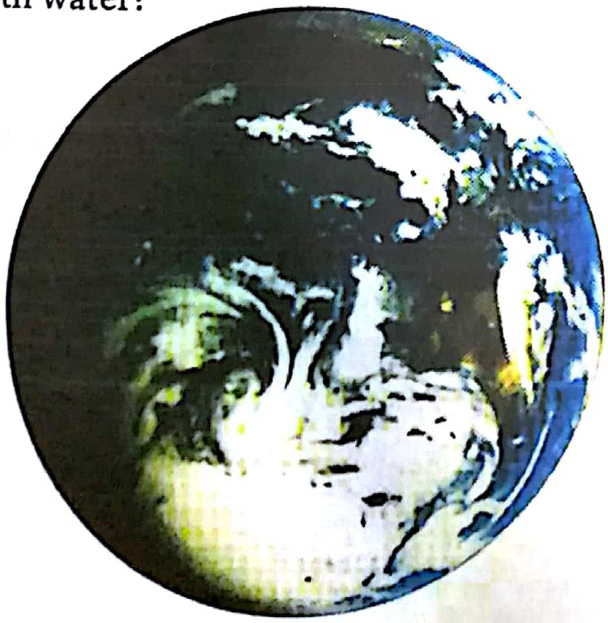
⑤ Repeat Steps 3 and 4 two more times.

Draw Conclusions

1. Total your counts. How many times did the catcher's right index finger touch water? Touch land?
2. Where did the catchers' fingers land more often? Why do you think so?
3. **Scientists at Work** Scientists **use numbers** to **collect data.** Using your data, estimate how much of Earth's surface is covered by water. Which is larger: dry land or the area covered with water?

Process Skill Tip

Collecting data by **using numbers** can help you answer questions. By doing the activity several times, you increase the amount of data you collect. Then you can **interpret the data** to find an answer to your question.



◀ **This view of Earth from space makes it easy to see why Earth is sometimes called the water planet.**

LEARN ABOUT

Water on Earth

FIND OUT

- why water is important
- types of water
- where water is found on Earth

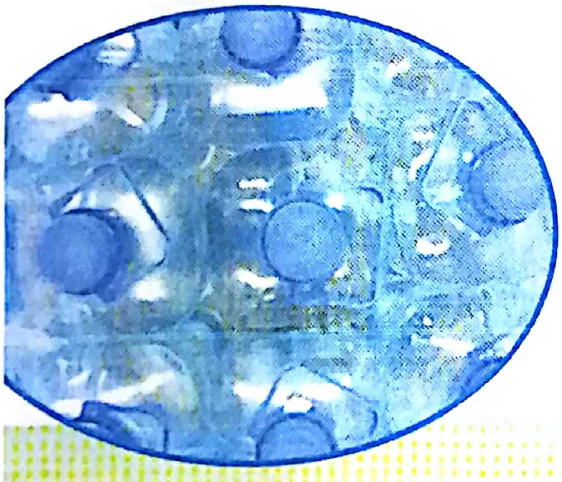
VOCABULARY

groundwater

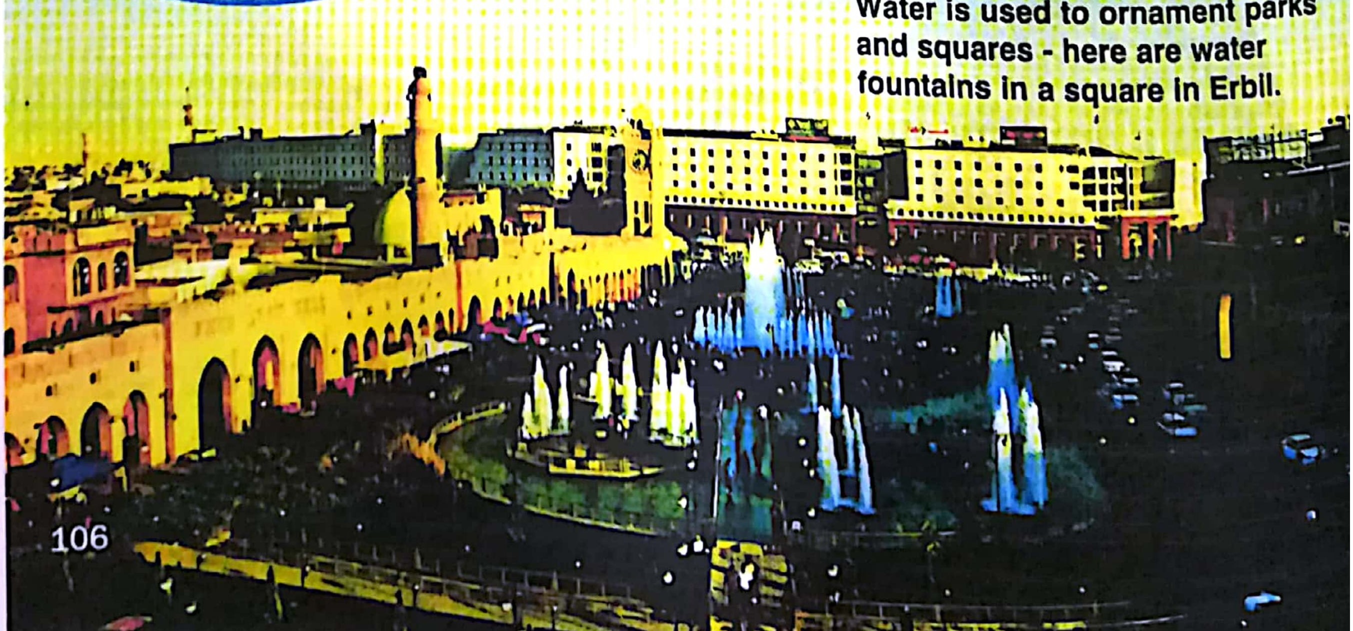
The Importance of Water

Without water there could be no life on Earth. Plants and animals need water to live. So do people. Two-thirds of your body is water. People must drink at least 2 liters of water each day to stay healthy. Even the foods you eat are full of water. Chicken is three-fourths water. A potato is four-fifths water.

Water is important to Earth's environment. Without water there would be no rivers, lakes, or oceans. There would be no rain, snow, or clouds.



◄ Industry uses about half of our fresh water. Water is used to wash things, to cool things down, and to make products.

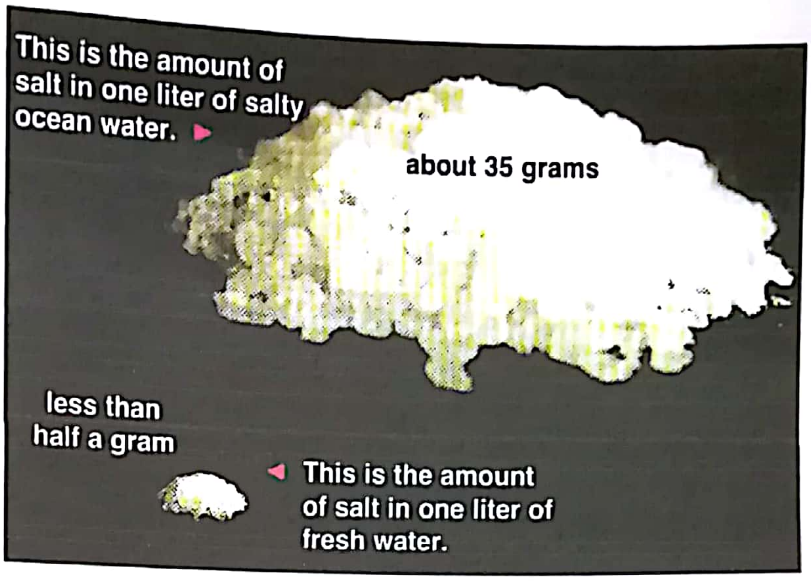


Water is used to ornament parks and squares - here are water fountains in a square in Erbil.

Types of Water

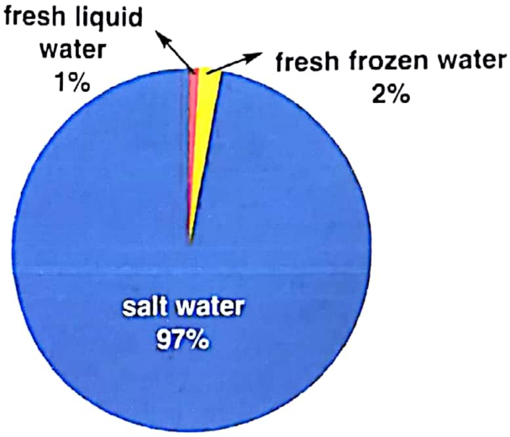
Most water on Earth is found in oceans. This water is salt water. Many plants and animals, such as algae and fish, live in salt water. Only a little of Earth's water is fresh. Fresh water has very little salt in it. Some fresh water has no salt at all. But most of the fresh water on Earth is frozen.

✓ **What are the two types of water on Earth?**



This is the amount of salt in one liter of salty ocean water.

This is the amount of salt in one liter of fresh water.



Most of Earth's fresh water is frozen. Glaciers and icecaps cover one-tenth of Earth's land surface. This iceberg has broken away from a glacier and is floating in the ocean.

Fresh Water

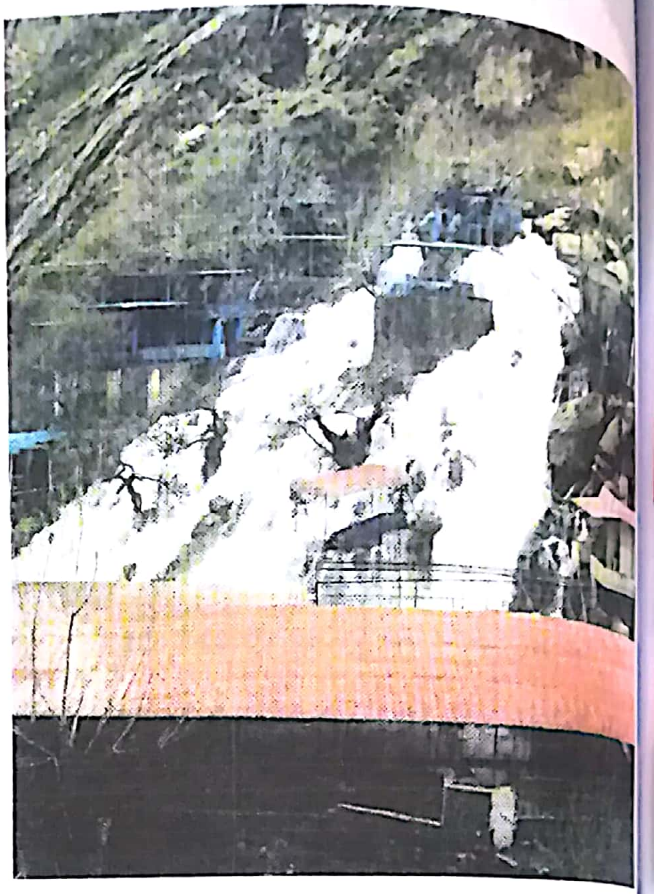
The rain or snow that falls to Earth is fresh water. This water flows over the ground and into rivers, streams, ponds and most lakes.

Fresh water can also be found under Earth's surface. This water is called **groundwater**.

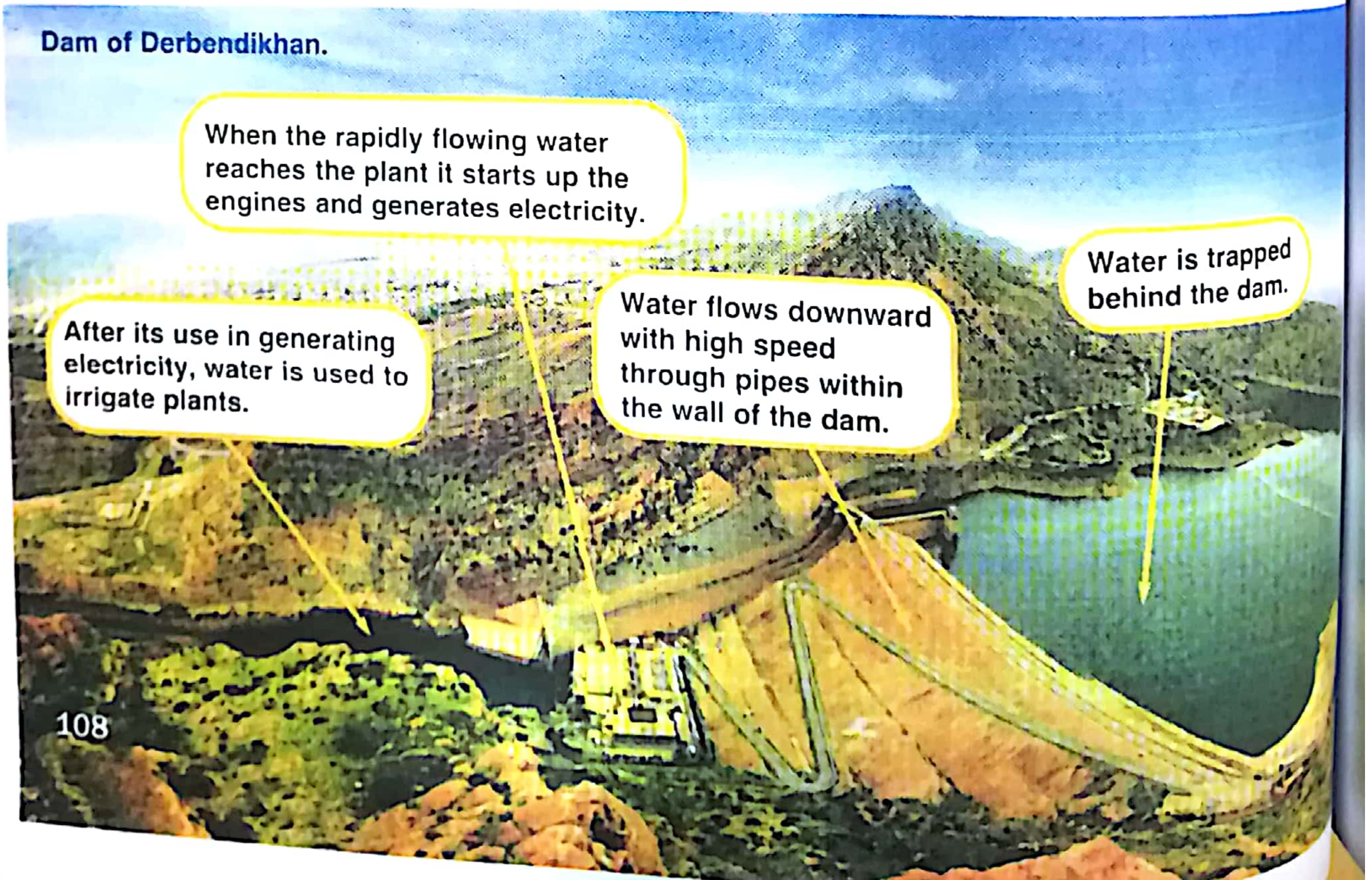
You use fresh water when you drink, bathe, water your plants, or cook your food.

Fresh river water is used to generate electricity: Dams are built on rivers forming lakes. Water flowing from the lakes behind the dams starts up the engines which generate electricity.

✓ **Where is fresh water found on Earth?**



▲ Groundwater flows out to Earth's surface as springs. The photo shows the Bikhal spring in Kurdistan.



Dam of Derbendikhan.

When the rapidly flowing water reaches the plant it starts up the engines and generates electricity.
Water is trapped behind the dam.
After its use in generating electricity, water is used to irrigate plants.
Water flows downward with high speed through pipes within the wall of the dam.

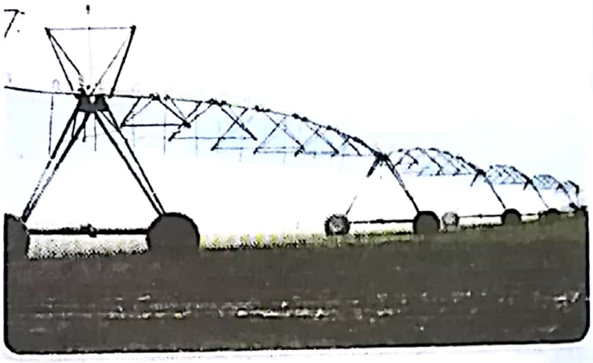
Conserving Fresh Water

To make sure there is enough clean fresh water for everyone, it is important to conserve it, and use it properly. Turn off the water when you brush your teeth. To avoid contaminating water, don't pour paints, oils, or other harmful liquids down the drain. These liquids can get into the water people drink and make it unhealthy.

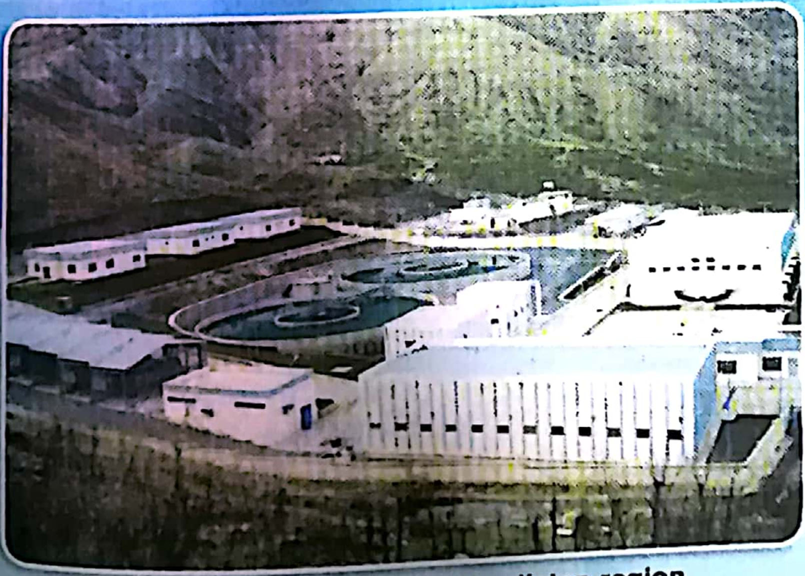
✓ **How can fresh water be conserved?**

THE INSIDE STORY

▲
- Precipitation in Kurdistan ranges between 300 and 1200 mm per year.
- Precipitation in Kurdistan increases gradually from plains towards mountains.



▲
- About half of the arable land in Kurdistan is irrigated.
- There are more than 20 thousand water wells in Kurdistan.



▲ Fresh water treatment plant in Kurdistan region.

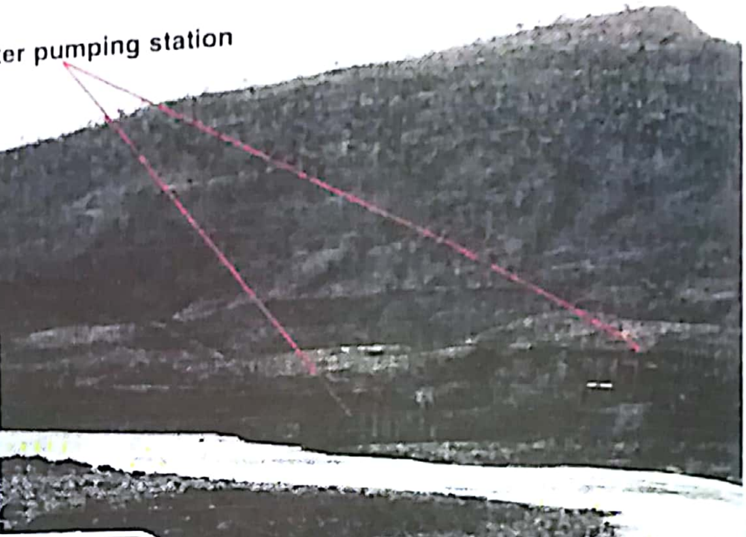
▲ Each person in Kurdistan region uses about 450 liters (more than two barrels) of fresh water every day for drinking, bathing, cooking, and washing, in addition to irrigation and industry.

THE INSIDE STORY

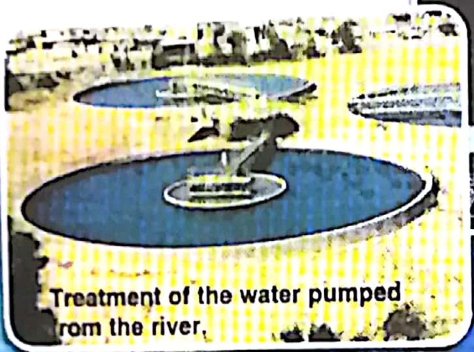
Fresh Water in the Cities of Erbil, Suleimaniyah and Duhok

Erbil

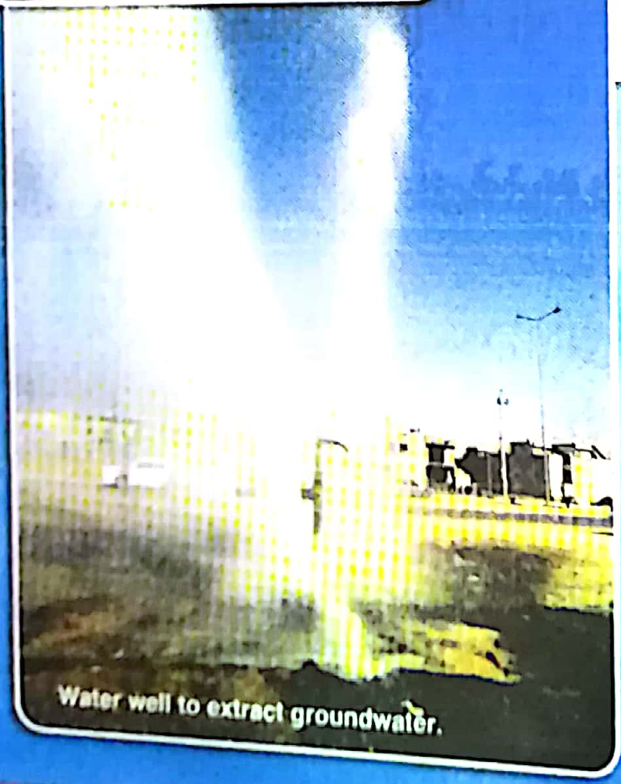
The capital Erbil gets its fresh water from two sources.



Pumping water from the Great Zab River.

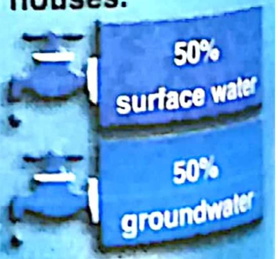


Treatment of the water pumped from the river.



Water well to extract groundwater.

① **Surface water:**
This water is drawn from the Great Zab River into the water treatment plant where it is purified before distribution to houses.

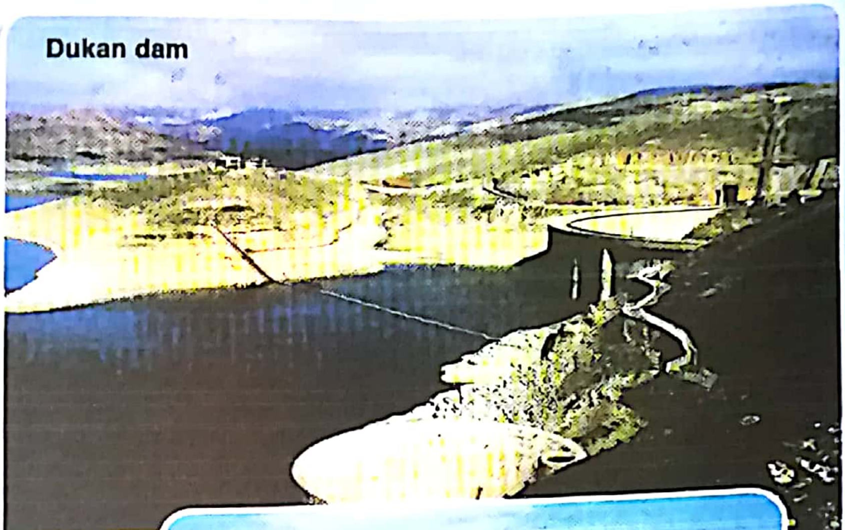


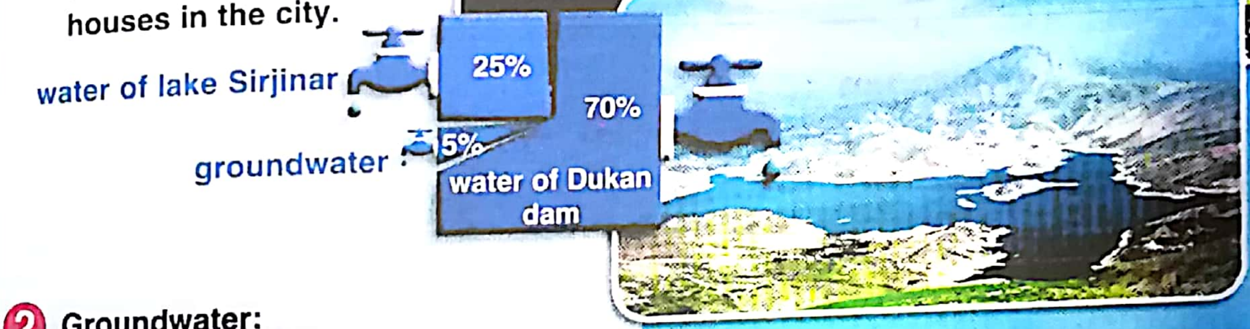
② **Groundwater:**
It is drawn from 450 deep wells, and pumped to the houses in Erbil.

Suleimaniyah

Suleimaniyah gets its fresh water from three sources.

① The Dokan dam surface water:
The water of the Great Zab River that collects behind this dam is piped to the water treatment plant where it is purified before distribution to the houses in the city.





② Groundwater:
It is drawn from 32 deep wells, then pumped to the homes in Suleimaniyah.

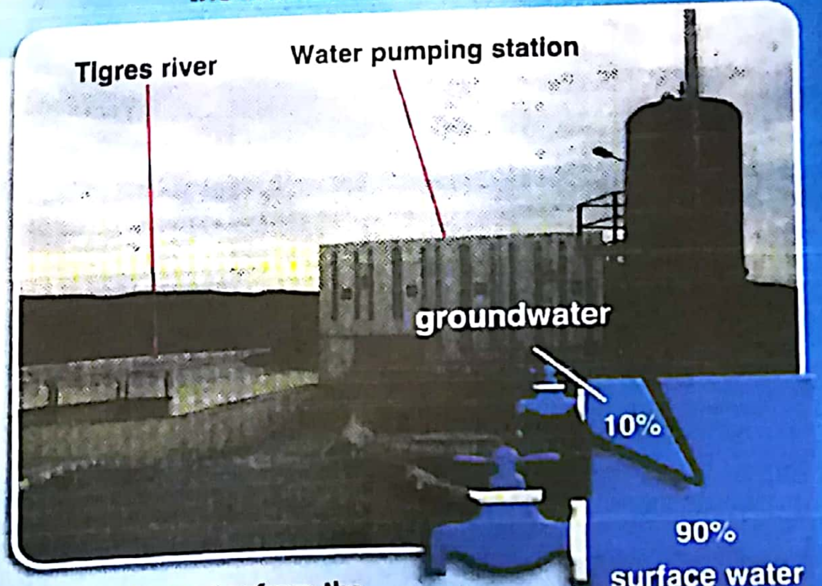
③ Lake Sirjinar surface water:
The water of 18 springs collects in this lake. It is then purified in the water treatment plant before distribution to the homes of the city.

Duhok

Dohuk city gets its fresh water from two sources.

① Surface water:
This water is drawn from the Tigres river. It is purified in the water treatment plant before distribution to the homes of the city.

② Ground water:
This water is drawn from 80 deep wells, then pumped to the homes of the city.



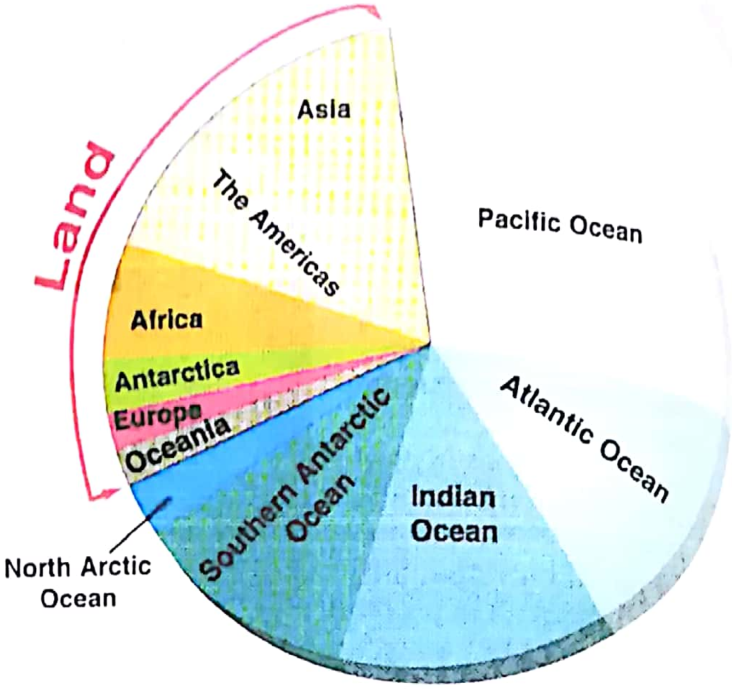
▲ Pumping water from the Tigres river.

Salt Water

The salt water of Earth's oceans covers more than two-thirds of our planet's surface. The Pacific Ocean is Earth's largest ocean. It is so big that all of Earth's land could fit inside it.

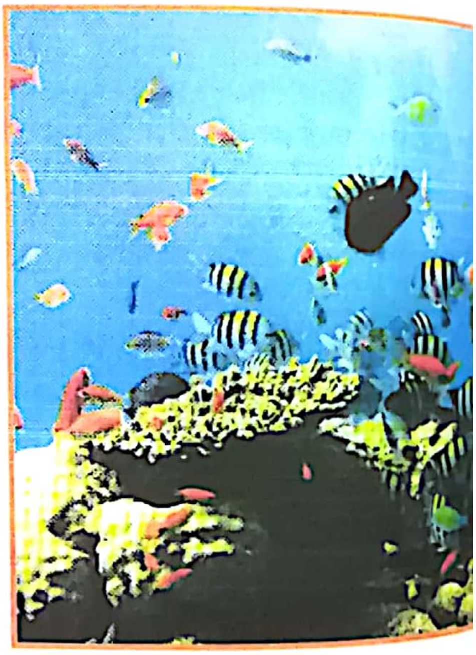
You may think that ocean water isn't important because you don't drink it. But fish and other ocean animals and plants are food for millions of people.

✓ **Where is salt water found on Earth?**



▲ Water covers about 70% of the planet Earth.

Fish in seas and oceans are an important source of food for millions of people. ►



▼ This ship is fishing in the open ocean.

▲ In some places fresh water is scarce. This water treatment plant removes the salt from ocean water to make it fresh.

Summary

More than two-thirds of Earth's surface is covered by water. Most of this water is the salt water of oceans and seas. Fresh water is found in lakes, ponds, rivers, springs and groundwater. Nothing could live on Earth without water.

Review

1. List three ways fresh water is used.
2. What is the underground water named?
3. What are the benefits of Earth's oceans?
4. Why do scientists believe that frozen water on Earth is an important resource?
5. **Test Prep** Which of the following is true of all ocean water?
   A It is warm.
   B It is salty.
   C It is fresh.
   D It is frozen.

LINKS

MATH LINK

Construct Graphs
Use the data shown on page 107 to make a bar graph that shows the part of Earth's water that is salty and the part that is fresh.

FINE ARTS LINK

Mobile
Find out about the kinds of animals that live in oceans, then make a mobile showing some of these animals.

LESSON 2

What Is the Water Cycle?

In this lesson, you can . . .

INVESTIGATE how fresh water and salt water evaporate.

LEARN ABOUT the movement of water on Earth and in the air.

LINK SCIENCE to writing and fine arts.

INVESTIGATE

Evaporation

Activity Purpose During a storm, rain forms puddles. After the rain stops, the puddles disappear. This process is called *evaporation*. In this investigation you will **control variables** to find out if some kinds of water evaporate faster than others.

Materials

- masking tape
- 4 identical jars
- 2 jar lids
- measuring cup
- water
- salt
- spoon
- ruler

Activity Procedure

① Put a strip of masking tape down the side of each jar. (Picture A)

② Using the measuring cup, pour half a cup of water into each jar. Stir a spoonful of salt into 2 of the jars. Mark these jars with an S. Mark the other 2 jars with an F.

F = Fresh Water.

S = Salt Water.

◀ Water on these berries turned to ice in the cold night air. The sun's heat will melt the ice.

3. Put a mark on the tape on each jar to show the level of water. Then put the lids on one *S* jar and one *F* jar. (Picture B)

4. **Predict** which jar the water will evaporate from first. **Record** your prediction.

5. Place the jars in a sunny place.

6. **Observe** the jars every day for a week. Mark the level of water in each jar each day.

Picture A

Picture B

Draw Conclusions

1. Did all the water evaporate from any of the jars? If so, which one?
2. **Compare** your prediction with your results. How did you make your prediction? Was your prediction correct?
3. **Scientists at Work** To find the answers to some questions, scientists test things that will change. These things are called *variables*. Then they add something to the experiment that they know won't change. This is called a *control*. What were the controls in this investigation?

Process Skill Tip

A control shows what would happen if no variable were being tested. **Controlling variables** is one way scientists make sure that their experiments are fair tests.

LEARN ABOUT

The Water Cycle

FIND OUT

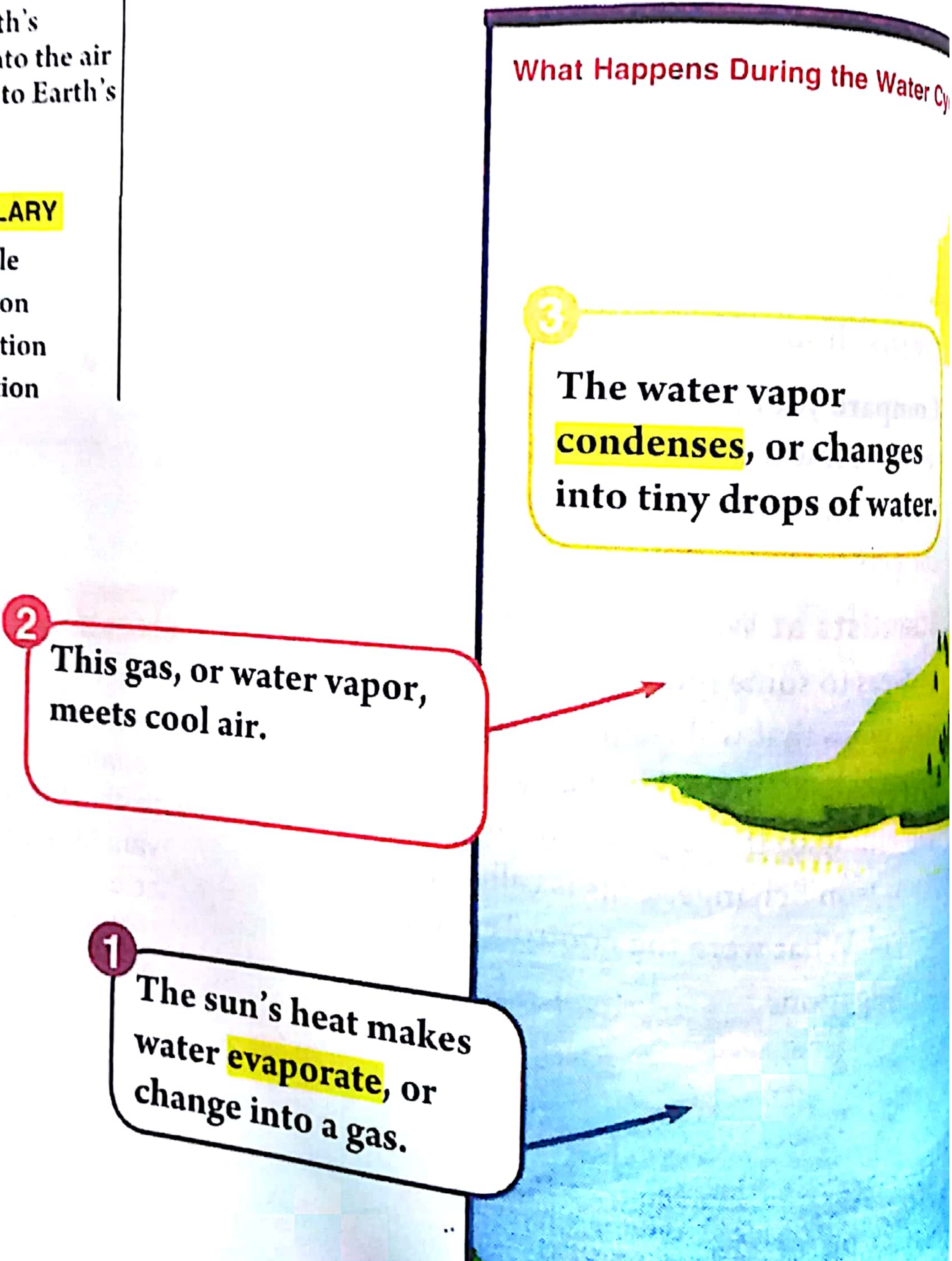
- how water changes form
- how water moves from Earth's surface into the air and back to Earth's surface

VOCABULARY

water cycle
evaporation
condensation
precipitation

Water moves from Earth's surface into the air and back to the surface again . The way water keeps doing this over and over is called the **water cycle.**

What Happens During the Water Cy



3 The water vapor **condenses**, or changes into tiny drops of water.

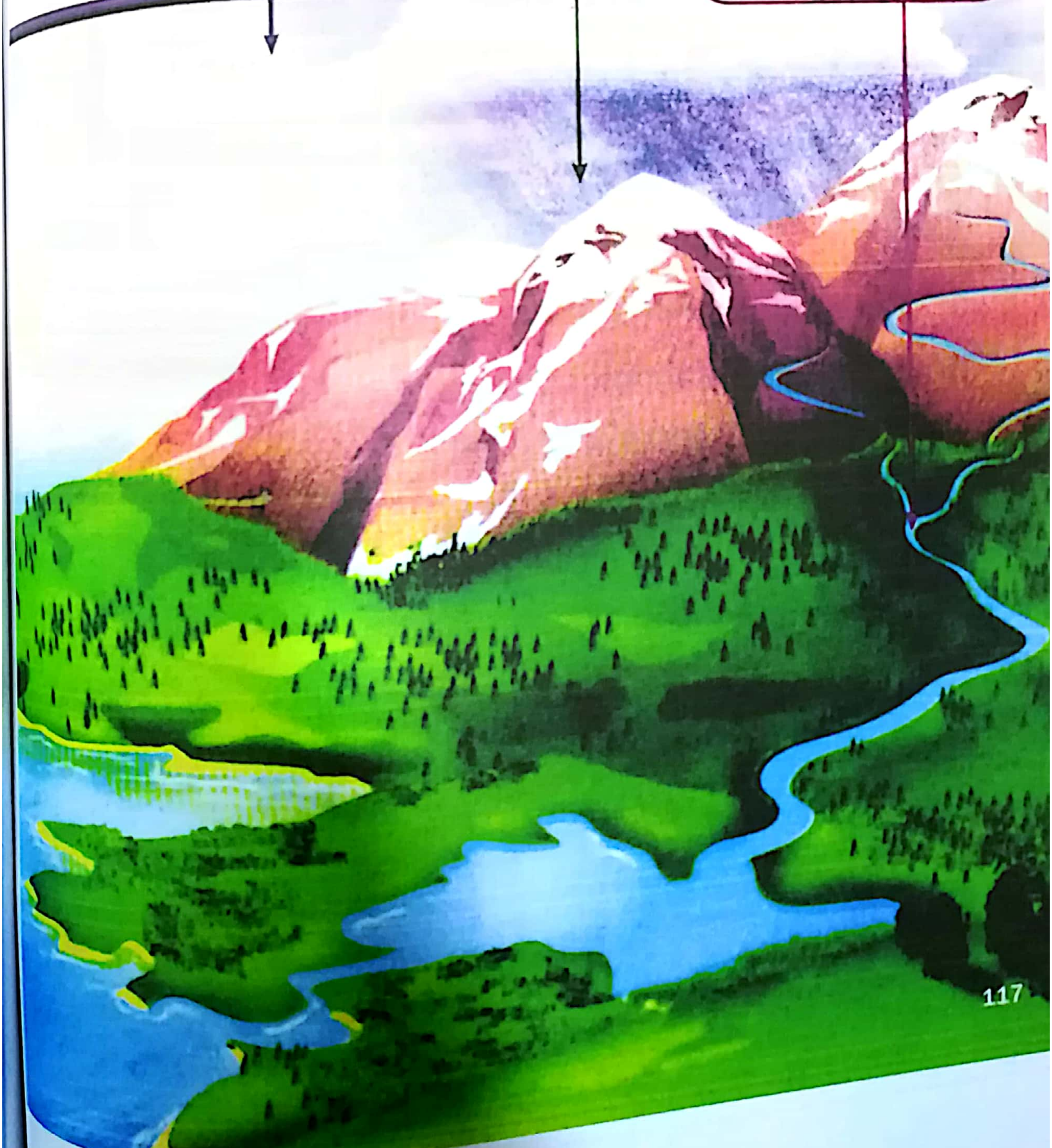
2 This gas, or water vapor, meets cool air.

1 The sun's heat makes water **evaporate**, or change into a gas.

4 Tiny water drops stick to dust particles to form clouds.

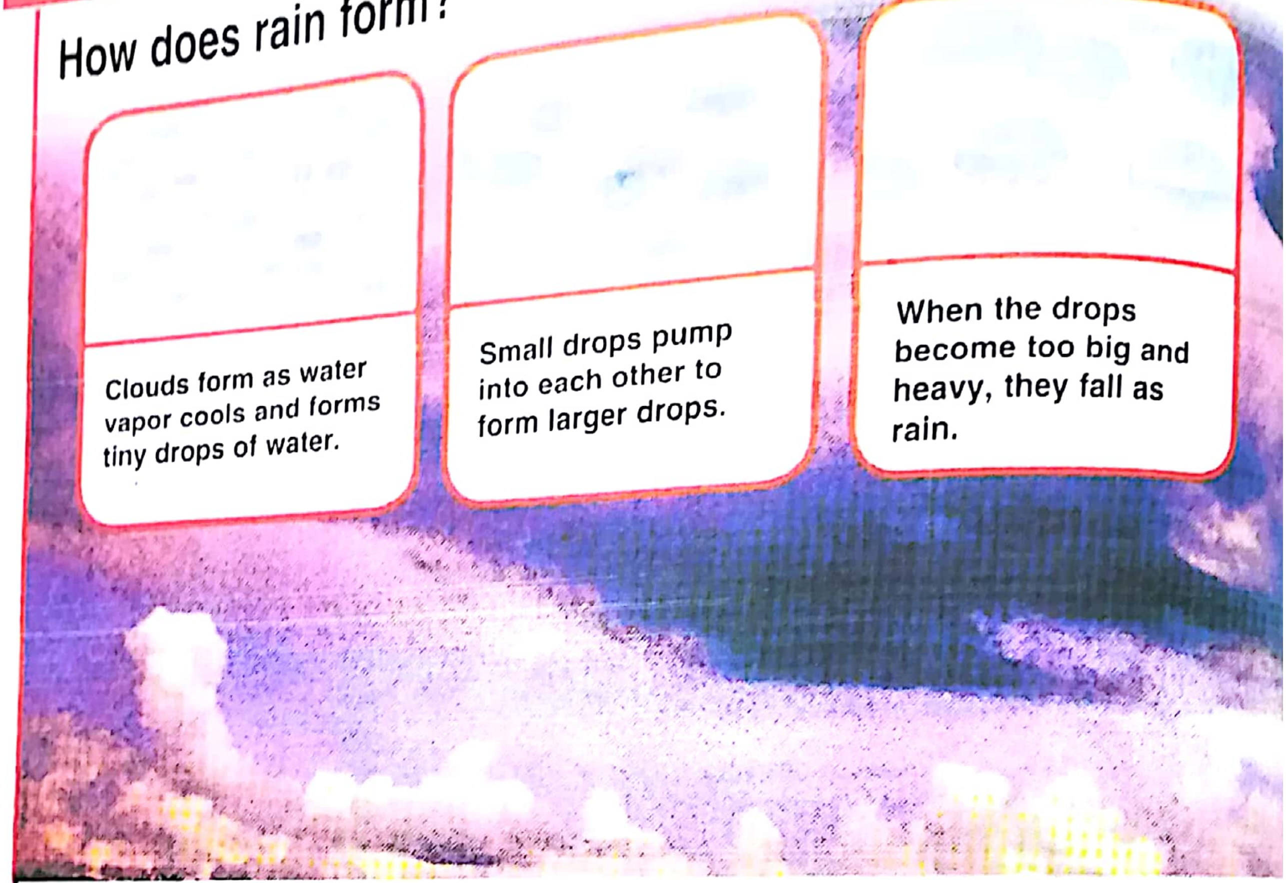
5 When the drops of water get large enough, precipitation, such as rain, hail or snow falls.

6 Rainwater flows into streams, lakes, seas and oceans. Then another water cycle starts again



THE INSIDE STORY

How does rain form?

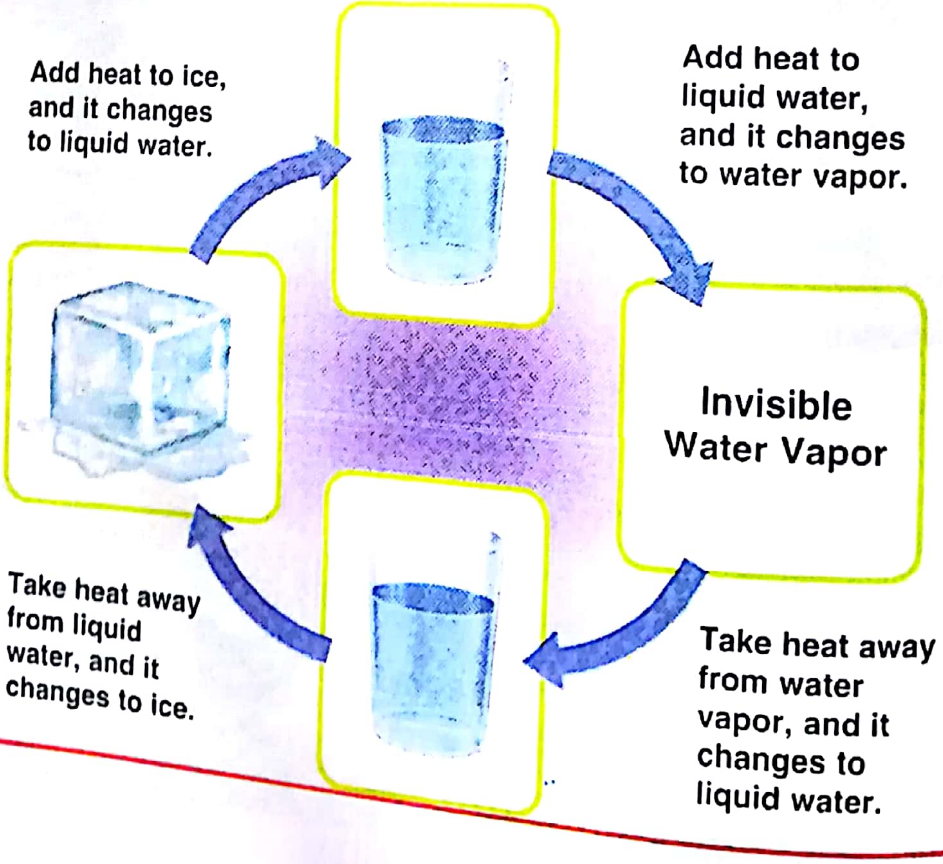


Clouds form as water vapor cools and forms tiny drops of water.

Small drops pump into each other to form larger drops.

When the drops become too big and heavy, they fall as rain.

How does the state of water change?



Add heat to ice, and it changes to liquid water.

Add heat to liquid water, and it changes to water vapor.

Take heat away from water vapor, and it changes to liquid water.

Take heat away from liquid water, and it changes to ice.

Summary

The water cycle starts with evaporation, moves to condensation, then to precipitation, and then moves again to evaporation.

Review

1. How does evaporation happen?
2. How do clouds form?
3. After precipitation, how does the water cycle continue?
4. What would happen if water evaporated then did not condense?
5. **Test Prep** The water cycle follows the following sequence:
   - A precipitation, evaporation, condensation.
   - B condensation, evaporation, runoff.
   - C evaporation, condensation, precipitation.
   - D evaporation, precipitation, condensation.

▲ Dispersed clouds in Kurdistan region.

LINKS

WRITING LINK

Informative writing - Description

Look for pictures in magazines that show the parts of the water cycle. For each picture, write a sentence that tells what is happening. Share your work with a family member.

FINE ARTS LINK

Water Cycle Poster

Make a poster to show the water cycle.On your poster, label the parts of the water cycle.

CHAPTER 2 Review and Test Preparation

Vocabulary Review

Use the terms below to complete the sentences 1 through 5. The page numbers in ( ) tell you where to look in the chapter if you need help.

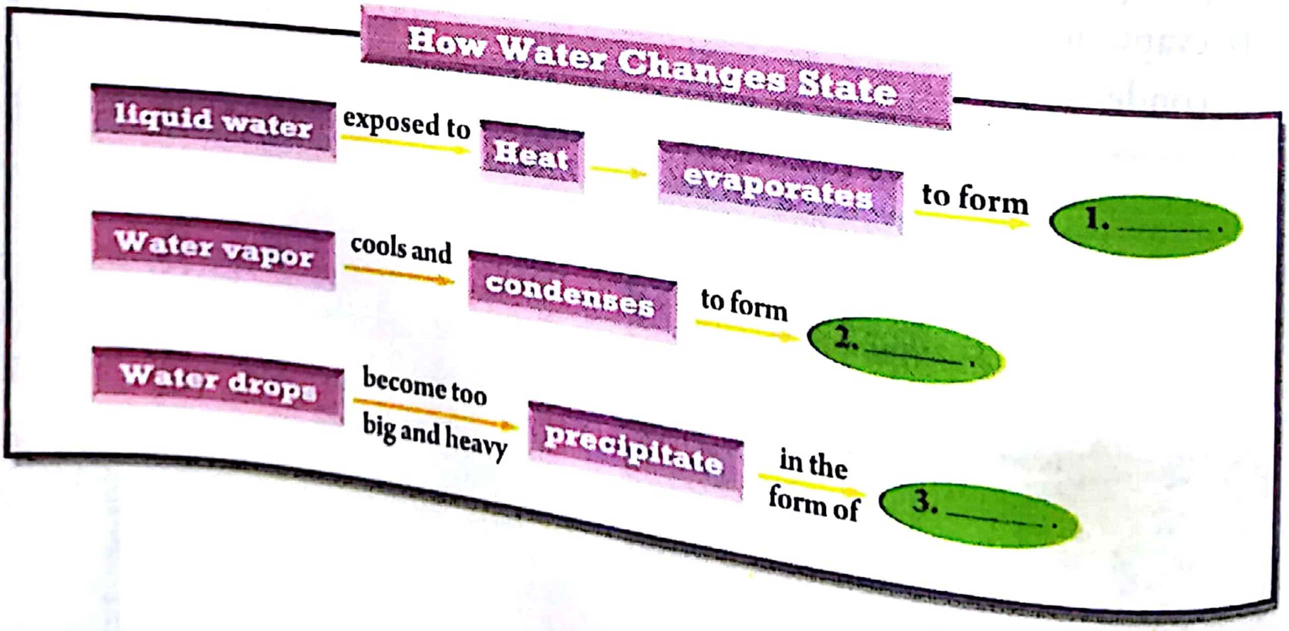
groundwater (108)
water cycle (116)
evaporation (116)
condensation (116)
precipitation (117)

1. Water that falls to Earth as rain, snow, sleet, or hail is ____ .
2. The process that changes a liquid into a gas is ____ .
3. The ____ is the movement of water from Earth's surface into the air and back to the surface again.
4. Fresh water found below Earth's surface is ____ .
5. The process that changes water vapor into tiny drops is ____ .

Connect Concepts

Write the terms where they belong in the concept map. Use the terms in the Word Bank.

water vapor **clouds** **rain**



Check Understanding

Circle the letter of the best choice.

1. Which is mostly water
   A rocks **C** shells
   B plants **D** soil

2. Where does the heat for the water cycle come from?
   A sun **C** soil
   B wind **D** ocean

3. Fresh water is **NOT** found ____
   A below Earth's surface
   B in lakes
   C in oceans
   D in rivers

4. Rain and snow are forms of ____
   A precipitation
   B transpiration
   C condensation
   D evaporation

Answer the following questions.

5. Show the importance of water to living things.
6. Explain why the sun is necessary to the water cycle?

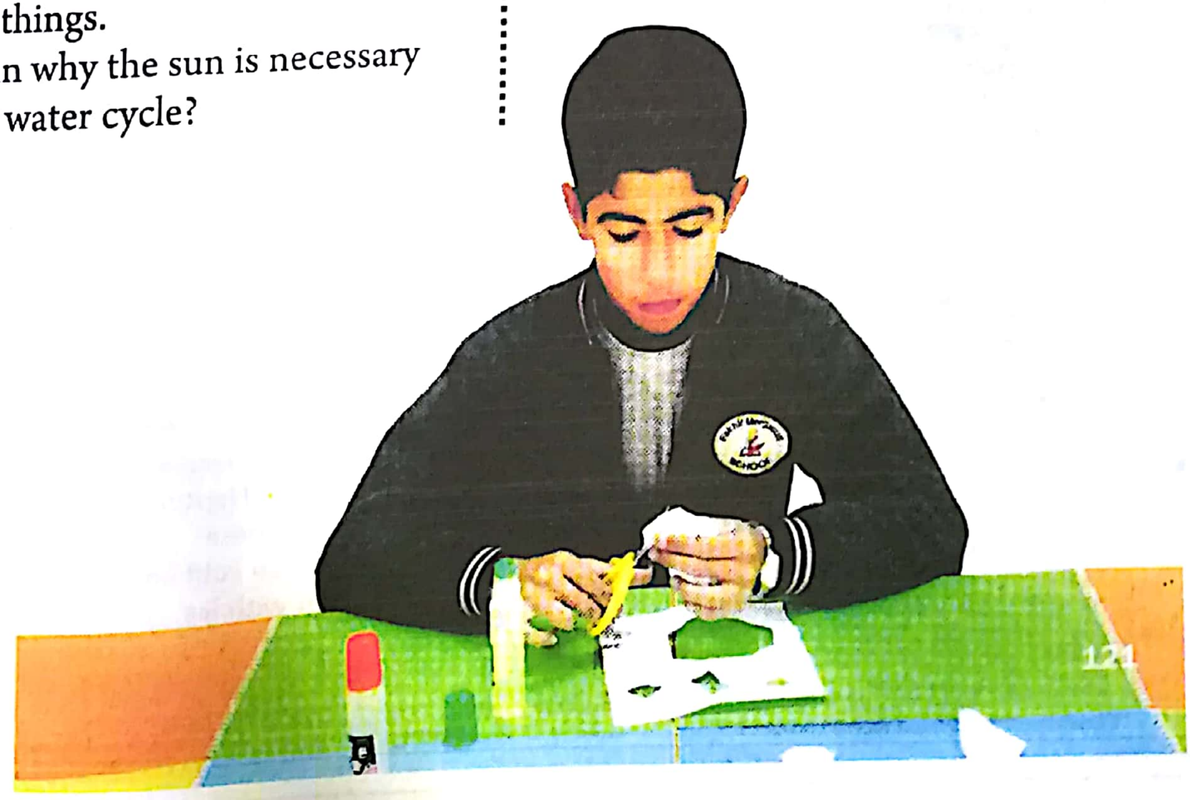
Process Skills Review

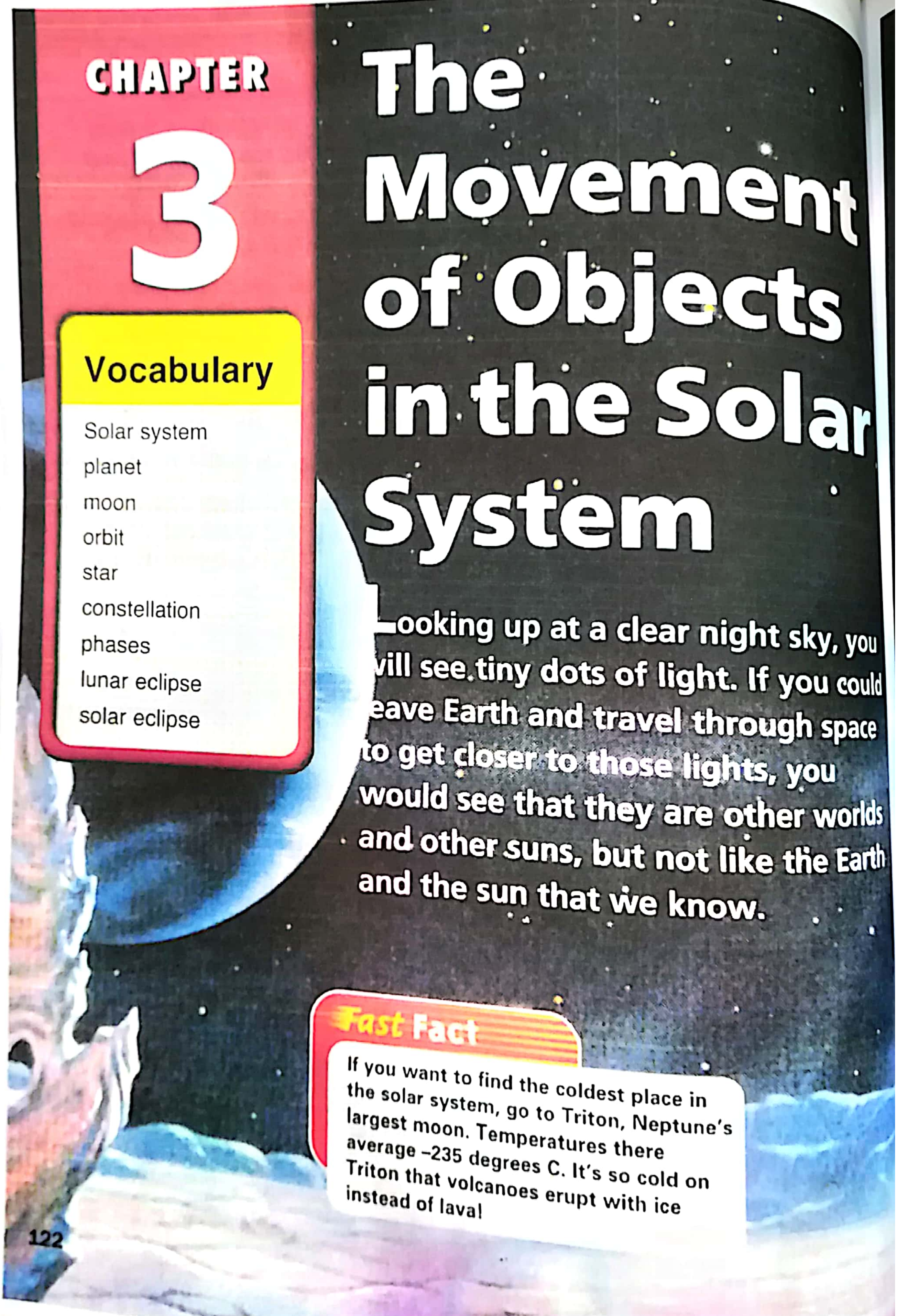
1. Suppose you are asked to keep track of the water used by your classmates. Tell how **using numbers** could make it easier to organize this data.
2. You see drops of rain falling. How could you **make a model** to show what happens to the rain? Tell how you could **control variables** to do this.

Performance Assessment

Make a Diagram of the Water Cycle

Work with a partner. Together, make a simple diagram of the water cycle. Label the changes in the state of water. Tell whether water has been heated or cooled as each change happens.





CHAPTER

3

The Movement of Objects in the Solar System

Vocabulary

- Solar system
- planet
- moon
- orbit
- star
- constellation
- phases
- lunar eclipse
- solar eclipse

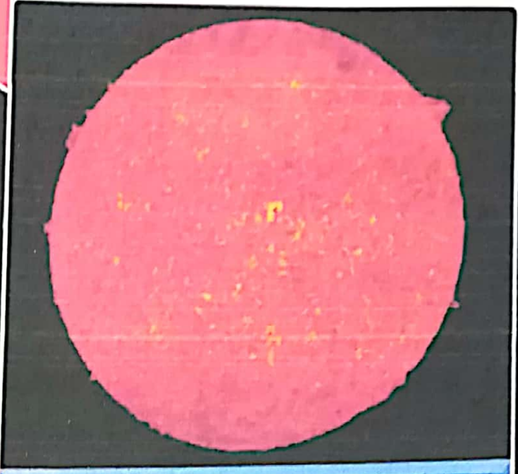
Looking up at a clear night sky, you will see tiny dots of light. If you could leave Earth and travel through space to get closer to those lights, you would see that they are other worlds and other suns, but not like the Earth and the sun that we know.

Fast Fact

If you want to find the coldest place in the solar system, go to Triton, Neptune's largest moon. Temperatures there average −235 degrees C. It's so cold on Triton that volcanoes erupt with ice instead of lava!

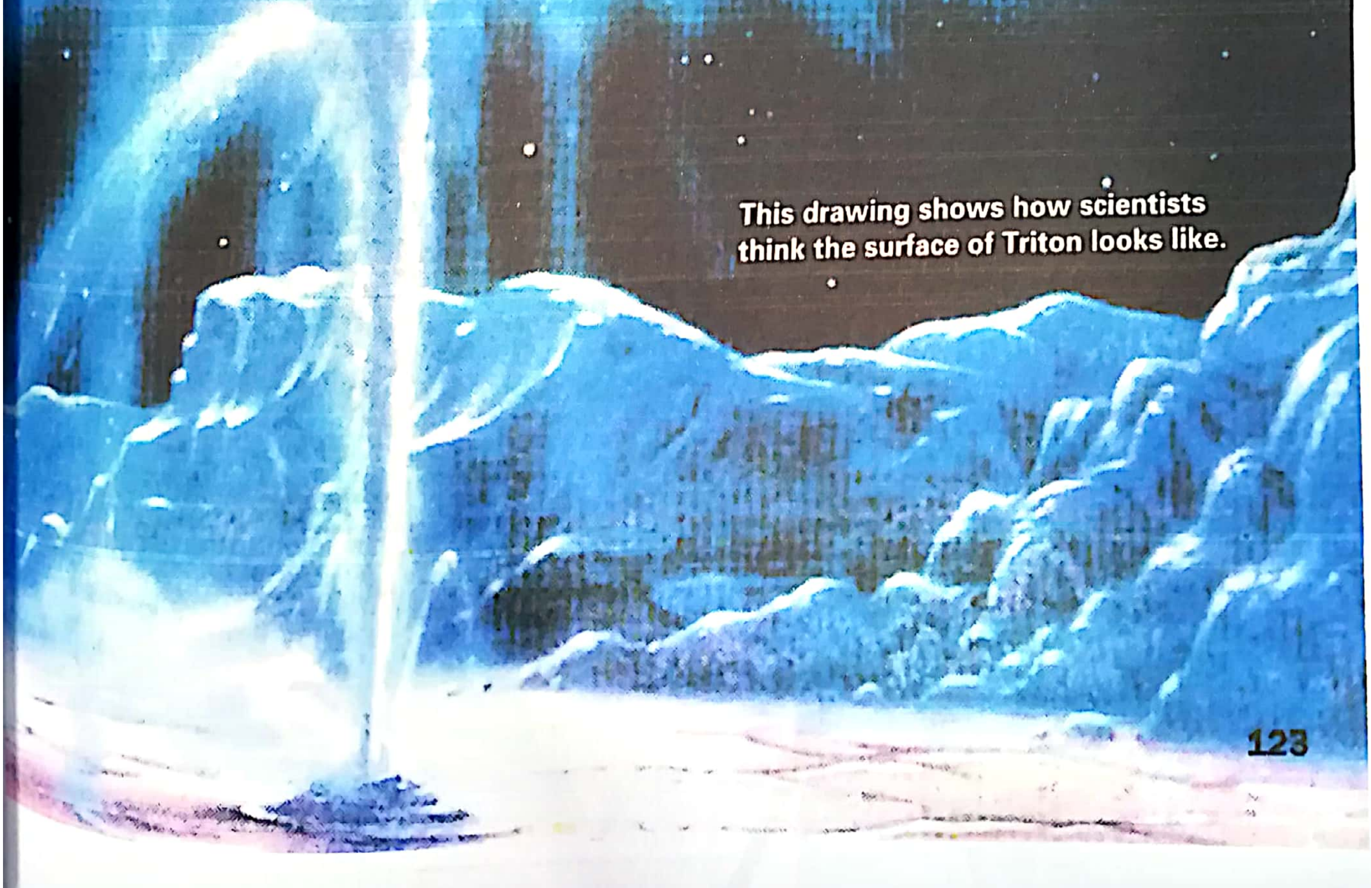
Fast Fact

The sun is big enough to hold over one million Earths. Even so, the sun is an average-sized star! Here's how the sun compares with some of the biggest stars that you can see in the night sky.



Star Sizes

Star	Diameter in Kilometers
Sun	1,400,000
Mu Cephi	4,000,000,000
VV Cephi	4,600,000,000
Epsilon Auriga	420,000,000,000



This drawing shows how scientists think the surface of Triton looks like.

LESSON 1

What Are Stars And Planets?

In this lesson, you can . . .

INVESTIGATE the stars and light.

LEARN ABOUT stars and light.

LINK SCIENCE to writing and health.

INVESTIGATE

Stars and Light

Activity Purpose The sun is a very bright star we can see in the daytime. Why can't we see other stars during the day? **Investigate** to find out. Then read and learn to find out more.

Materials

- black paper and tape
- flashlight
- styrofoam cup

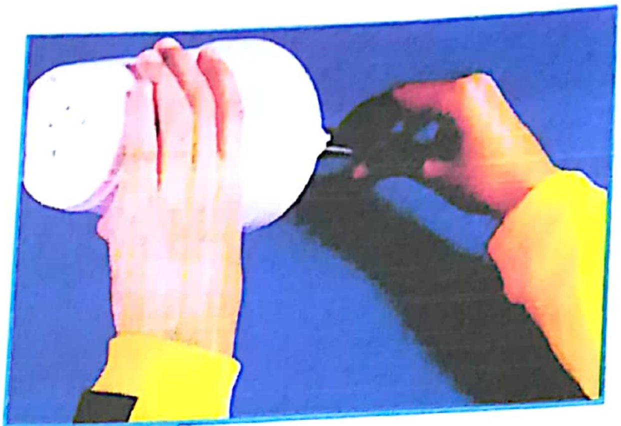
Activity Procedure

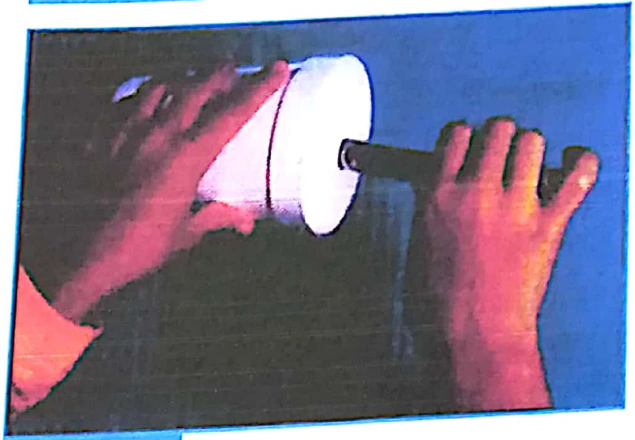
1. Make several holes in the bottom of the cup.
2. Tape the paper to a wall. Point the bottom of the cup toward the paper. Shine the flashlight into the cup. What do you see?

Telescopes help us see things that are far away.

③ Turn off the lights in the classroom. Shine the flashlight again. What do you see now?

④ **Infer** why the "stars" look different with the lights on and with the lights off.


Picture A


Picture B

Draw Conclusions

1. Why do the stars appear unclear when the classroom is lighted?
2. What happens to the stars if you shine the flashlight from further away?
3. **Scientists at Work** Scientists **use** what they see to **draw conclsions** as to why something happened. **Draw conclusions** as to why some "stars" seemed brighter than other "stars" on the black paper .

Process Skill Tip

When you **infer**, you use what you see to figure out why something happened.

LEARN ABOUT

Stars And Planets

FIND OUT

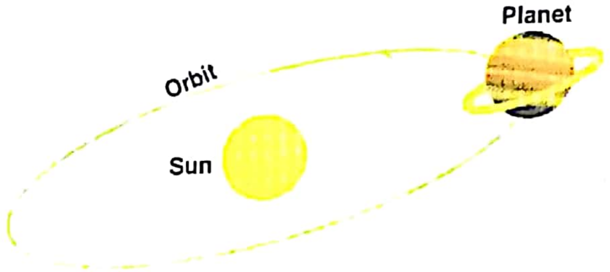
- the constituents of the solar system
- stars

VOCABULARY

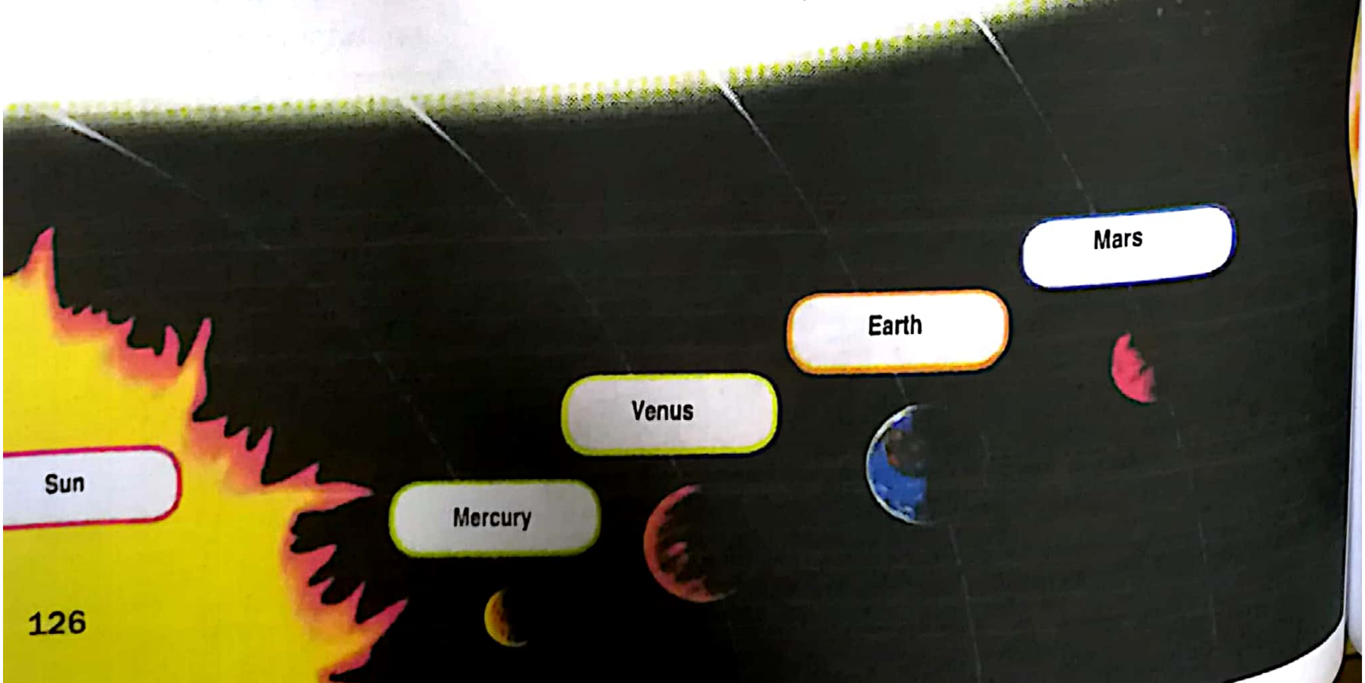
solar system
planet
moon
orbit
star
constellation

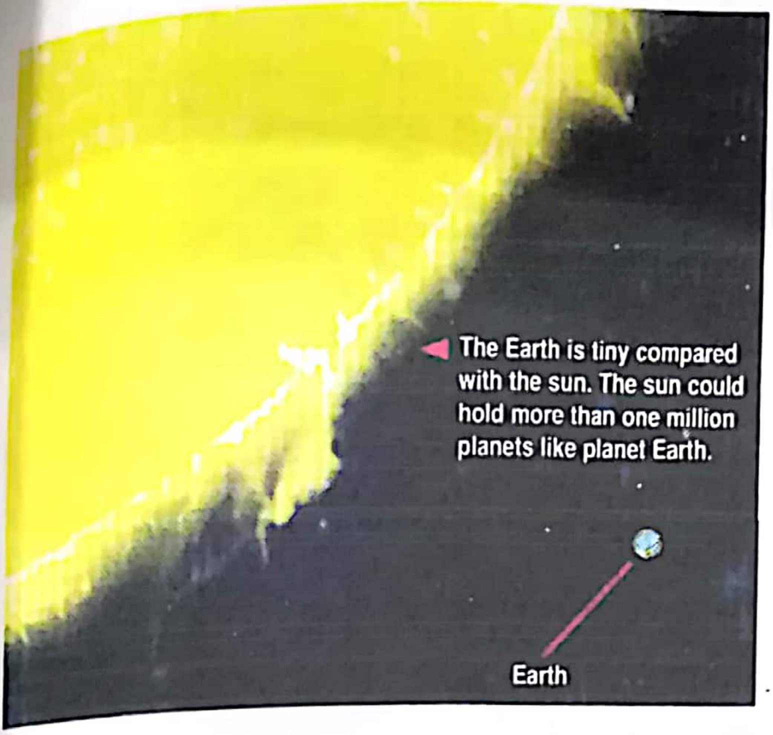
Planets

The **solar system** is made up mainly of the sun, the planets, and their moons. A **planet** is a large body of rock or gas that orbits the sun. A **moon** is a large, rocky object that orbits a planet. The sun is the center of the solar system. The planets move in paths around the sun. Each path is called an **orbit**.



The solar system has eight planets including Earth. These planets differ from one another in appearance, size, and distance from the sun, and the number of moons too. Earth has one moon. Other planets have either none or many moons.

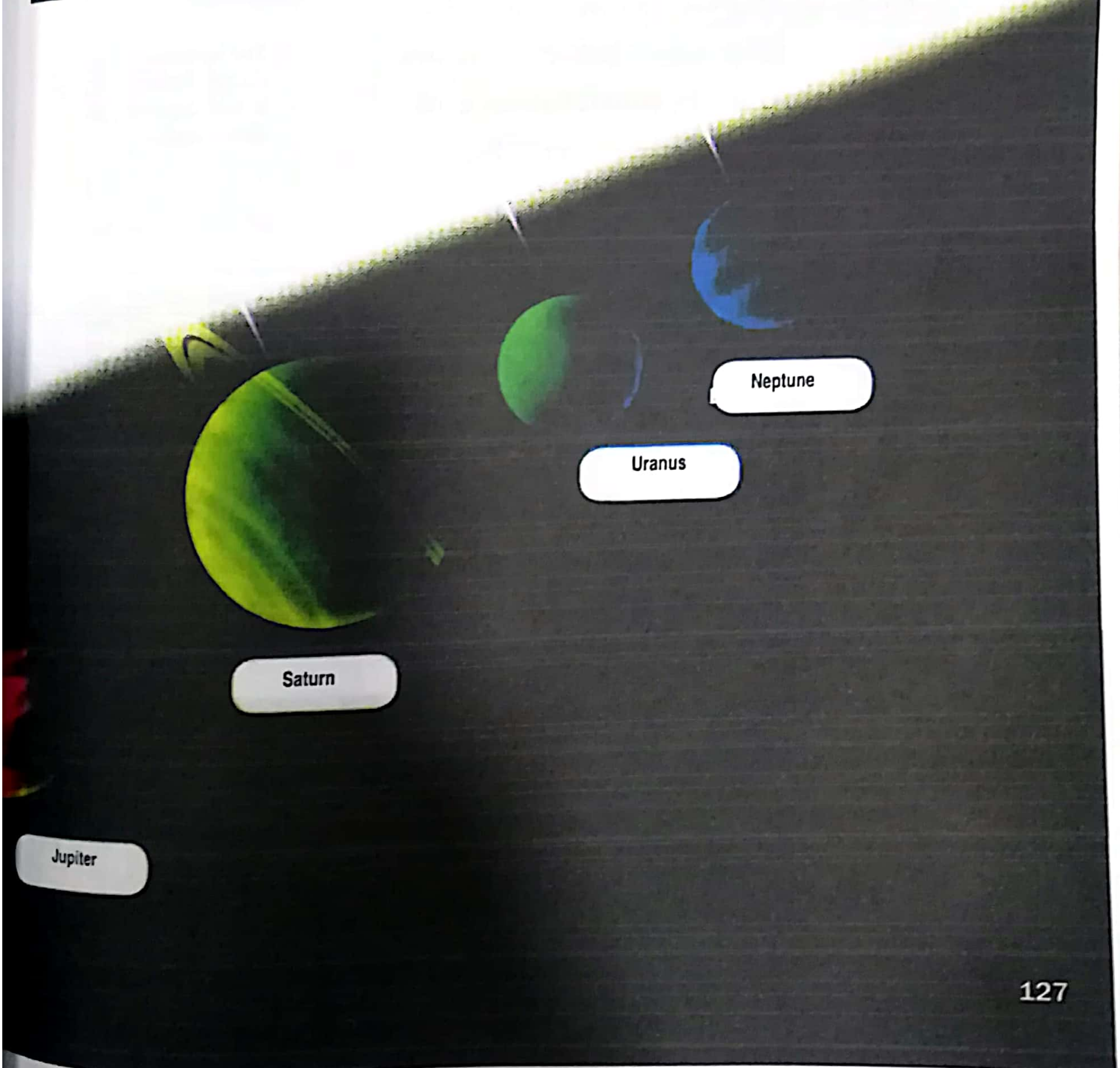




The Earth is tiny compared with the sun. The sun could hold more than one million planets like planet Earth.

You can see a few parts of the solar system at night. During the day, these parts are still there, but we cannot see them because of the strong sunlight.

✓ **What is the solar system made up of?**



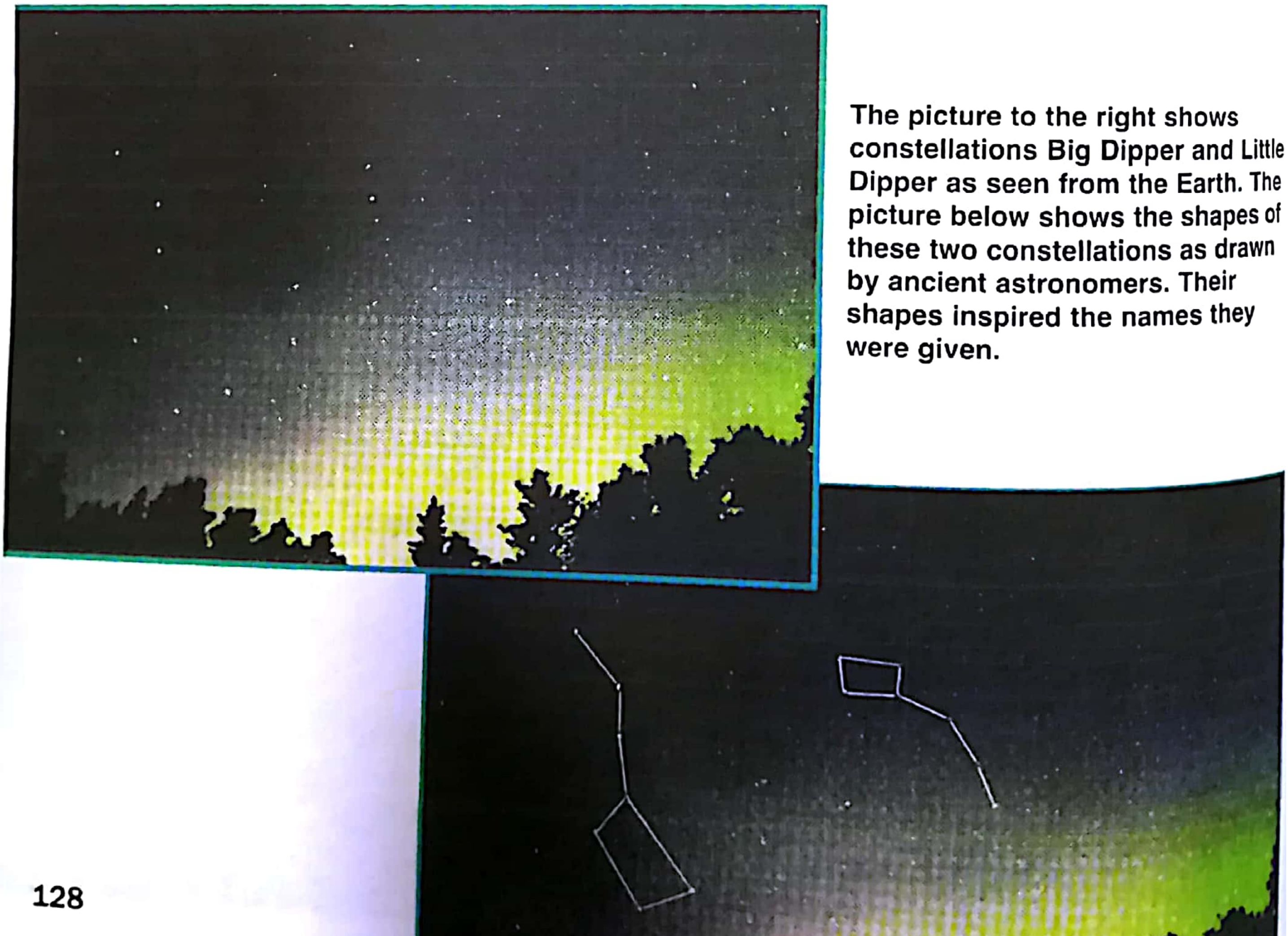
Stars

Stars are hot balls of glowing gases. Hot gases produce light and heat. The sun is the star closest to Earth . You can see the sun during the day, but most of the stars appear only at night. Stars vary from smaller than the sun to larger. Stars appear as tiny dots of light, because they are very far away from Earth.

If you look at the night sky you can see groups of stars, gathered closely together forming distinctive shapes. Such a group of stars is called a **constellation**. Each constellation has a distinctive name like the Big Dipper, the Little Dipper, and Orion.

▲ The shape of constellation Orion as drawn by ancient astronomers.

✓ **What is a star?**



The picture to the right shows constellations Big Dipper and Little Dipper as seen from the Earth. The picture below shows the shapes of these two constellations as drawn by ancient astronomers. Their shapes inspired the names they were given.

▲ This is constellation Orion as seen from the Earth. Try to infer its shape using the drawing shown in a circle on the preceding page.

Summary

The solar system has eight planets that orbit the sun. Earth is one of these planets. Stars are huge balls of glowing gases, and the sun is one of them. Stars appear in distinctive groups called constellations.

Review

1. How many planets are there in the solar system?
2. What is the difference between planets and stars?
3. Why is the orbit of Saturn longer than the orbit of Earth?
4. What is the difference between a planet and a constellation?
5. **Test Prep** What is the best time to see stars? ____

   A morning
   B afternoon
   C daytime
   D night

LINKS

WRITING LINK

Informative writing - Description
Choose a planet. Find out four facts about it, and write a report. Share your report with your classmates.

HEALTH LINK

Protection From Sun Rays
Sun rays can harm the skin. That's why people use sunscreens. Sunscreens have an SPF number. Go to a pharmacy with an adult member of your family and ask about the sunscreen we use to protect our skin during summer.

LESSON 2

What Results When the Moon and Earth Move?

In this lesson, you can . . .

INVESTIGATE the phases of the moon.

LEARN ABOUT why the moon seems to change.

LINK SCIENCE to math and writing.

INVESTIGATE

Phases of the Moon

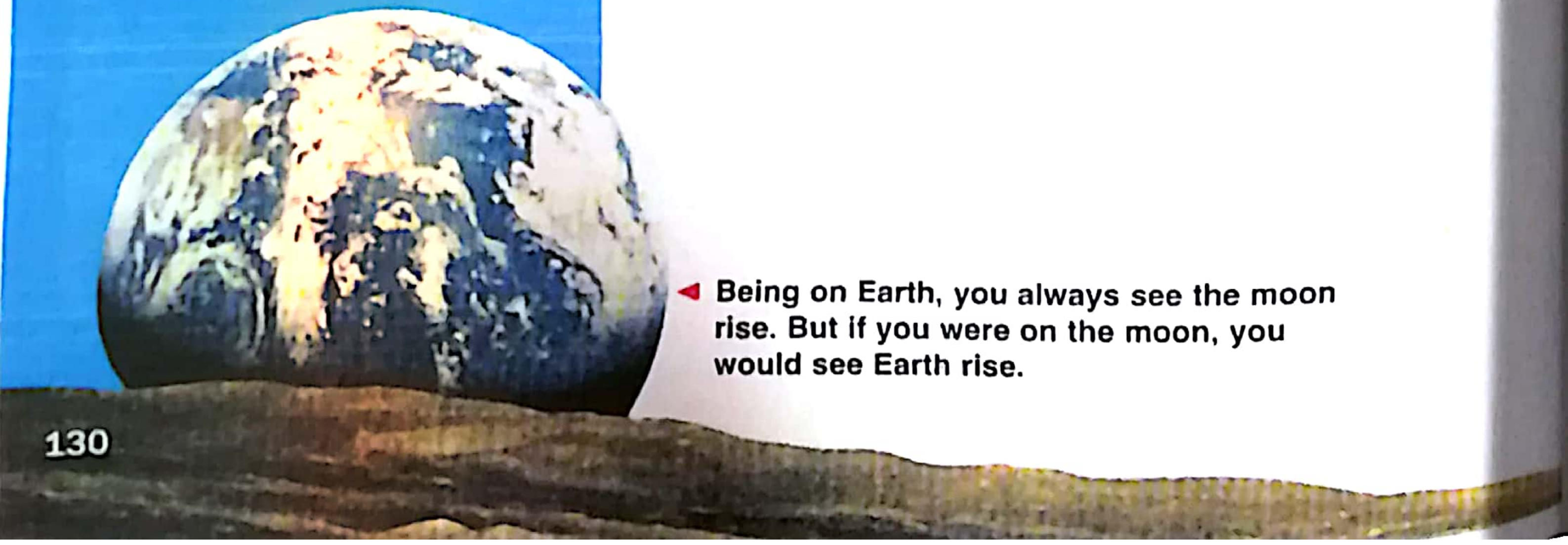
Activity Purpose If you look at the moon each night, you will see that it seems to change shape. These shapes are called *phases*. In this investigation you will **observe** how a light shining on a ball looks different as you move around the ball.

Materials

- lamp with no shades
- ball

Activity Procedure

① Use Picture A to set up the area. The teacher will darken the classroom. Now hold the ball at position 1. Have a classmate shine a flashlight on the ball. Have a second classmate stand in the middle to **observe** the ball, and make a drawing of the ball's lighted side.



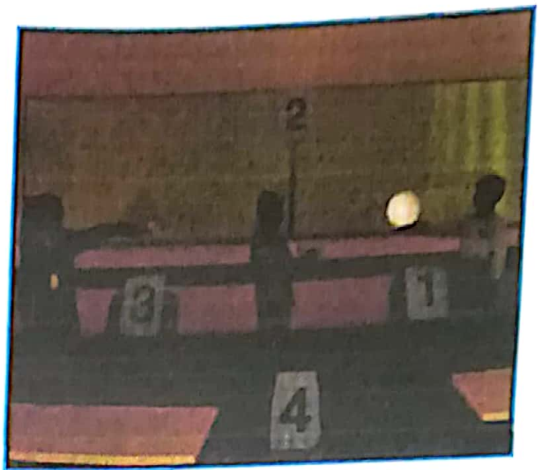
◀ Being on Earth, you always see the moon rise. But if you were on the moon, you would see Earth rise.

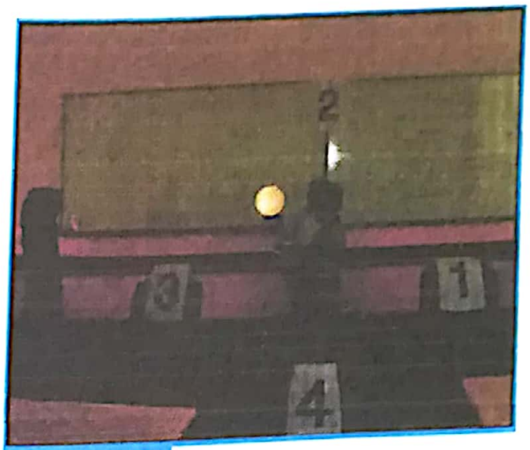
2. Move first to position 2, then 3 and then 4. The second partner turns each time to keep facing the ball, to **observe** it, and **draw** the lighted part at each position.

3. Switch roles and repeat the procedure so that you can all observe the patterns of light on the ball.

Make an Observation Chart

position 1	position 2
position 3	position 4


Picture A


Picture B

Draw Conclusions

1. What part of the ball was lighted at each position?
2. What does the ball represent? The flashlight? The classmate recording the observations?
3. **Inquiry Skill** If the ball represents the moon, what can you infer that the different parts of the lighted ball represent?

Process Skill Tip

When you **observe** something, you use your senses to get information about it. When you **infer**, you use your observations to **draw a conclusion.**

LEARN ABOUT

What Results From the Movement of the Moon and Earth?

FIND OUT

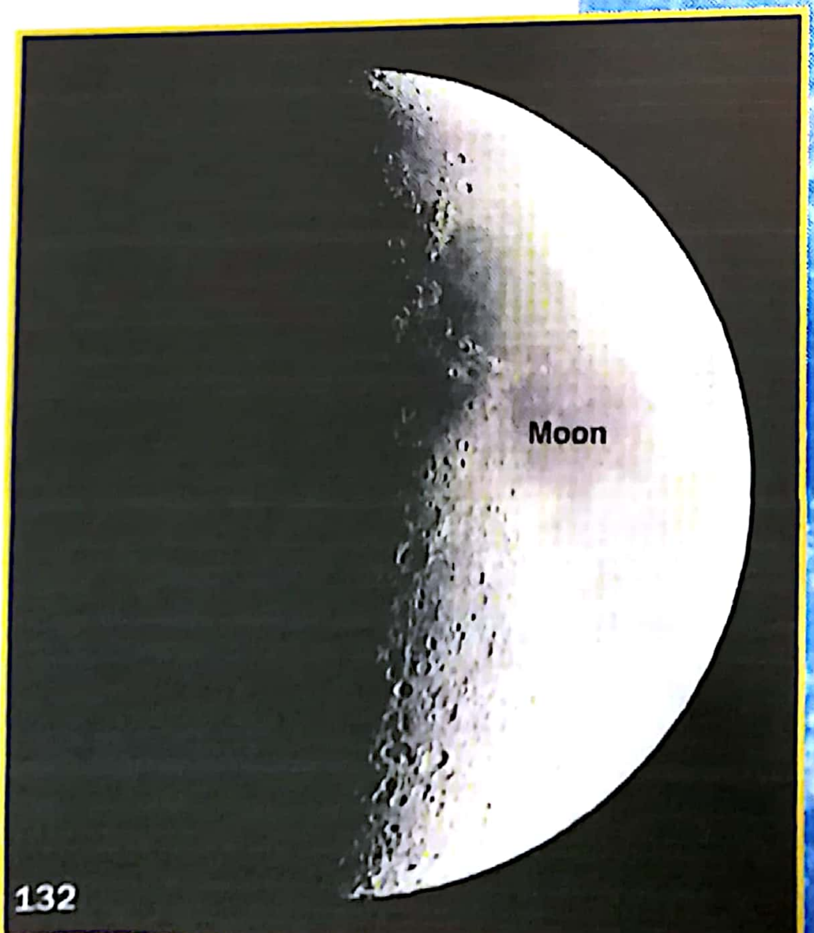
- what the moon's properties are
- what the moon's phases are
- what causes lunar and solar eclipses

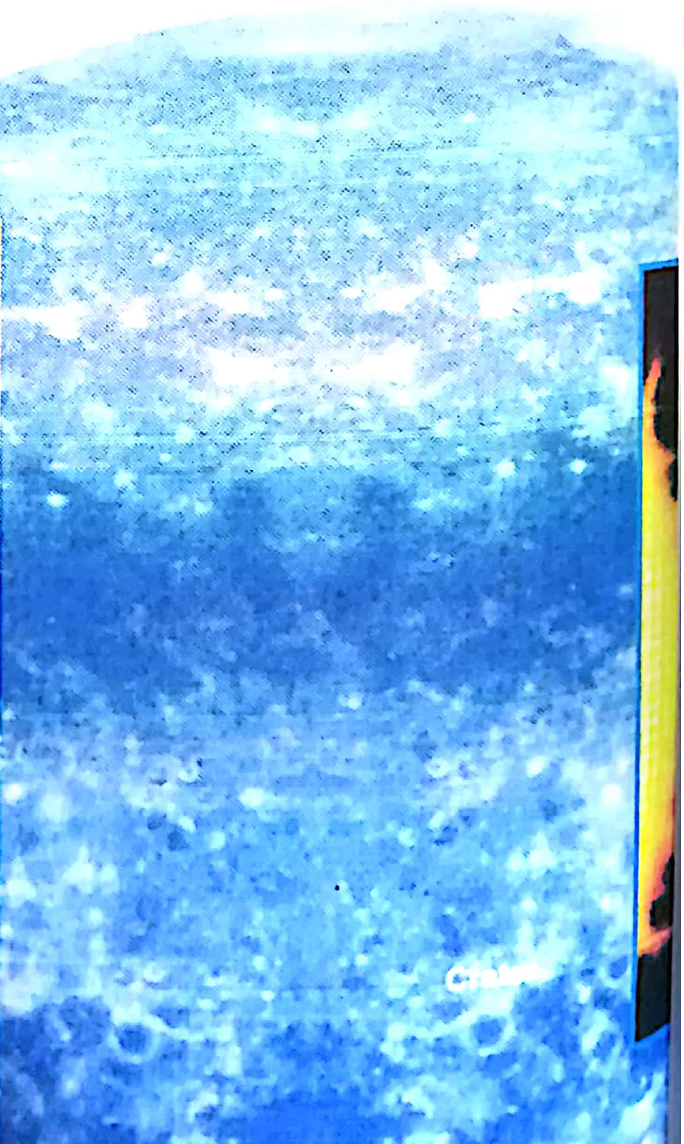
VOCABULARY

moon phases
lunar eclipse
solar eclipse

Moonlight

The moon is the biggest object you can see in the night sky. It appears to shine brightly at night. But the moon does not emit light of its own. The moonlight we see from Earth is the light the moon reflects from the sun.



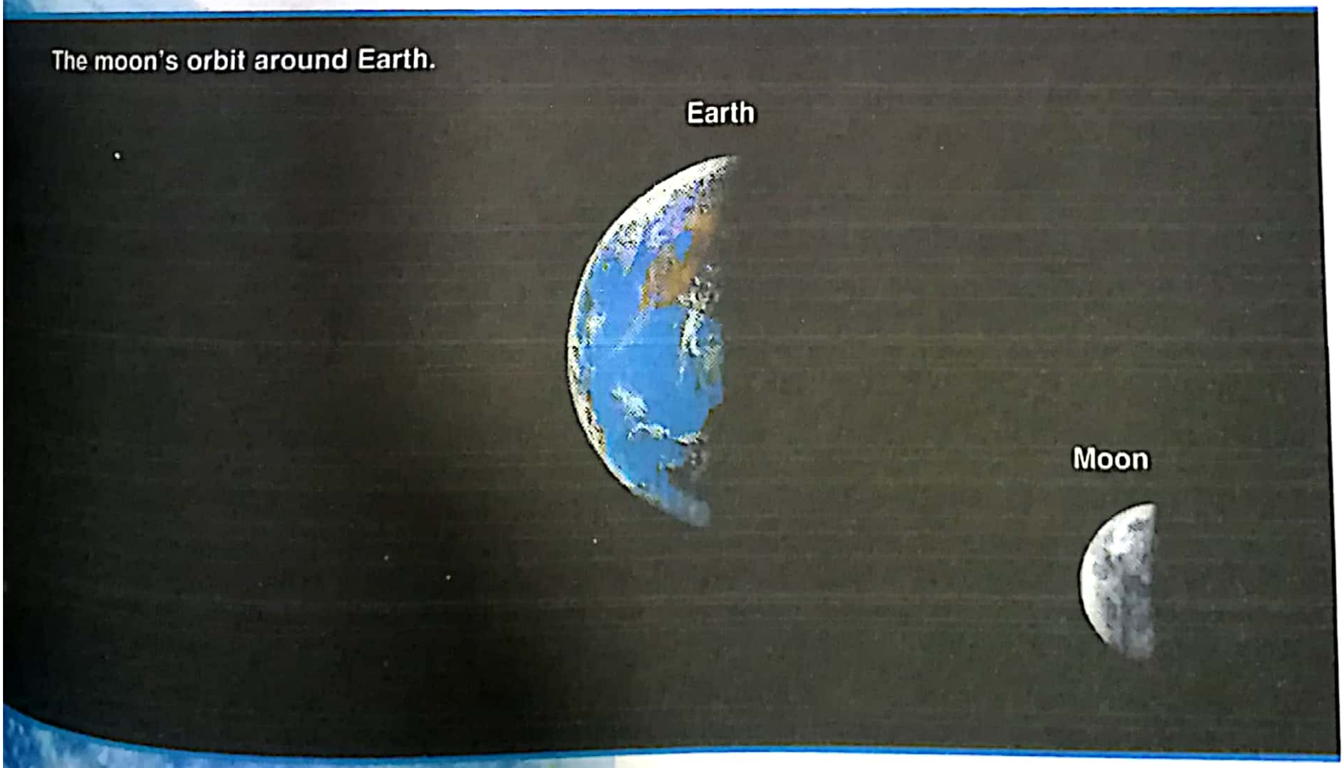


The Moon

The moon is a hard, rocky ball that orbits Earth. It takes about 29.5 days for the moon to orbit Earth.

When we look at the moon, we can see plenty of spots. Some spots are holes called craters. A crater is made when a large rock moving through space hits the moon.

✓ **Which part of the moon is lit by the sun?**



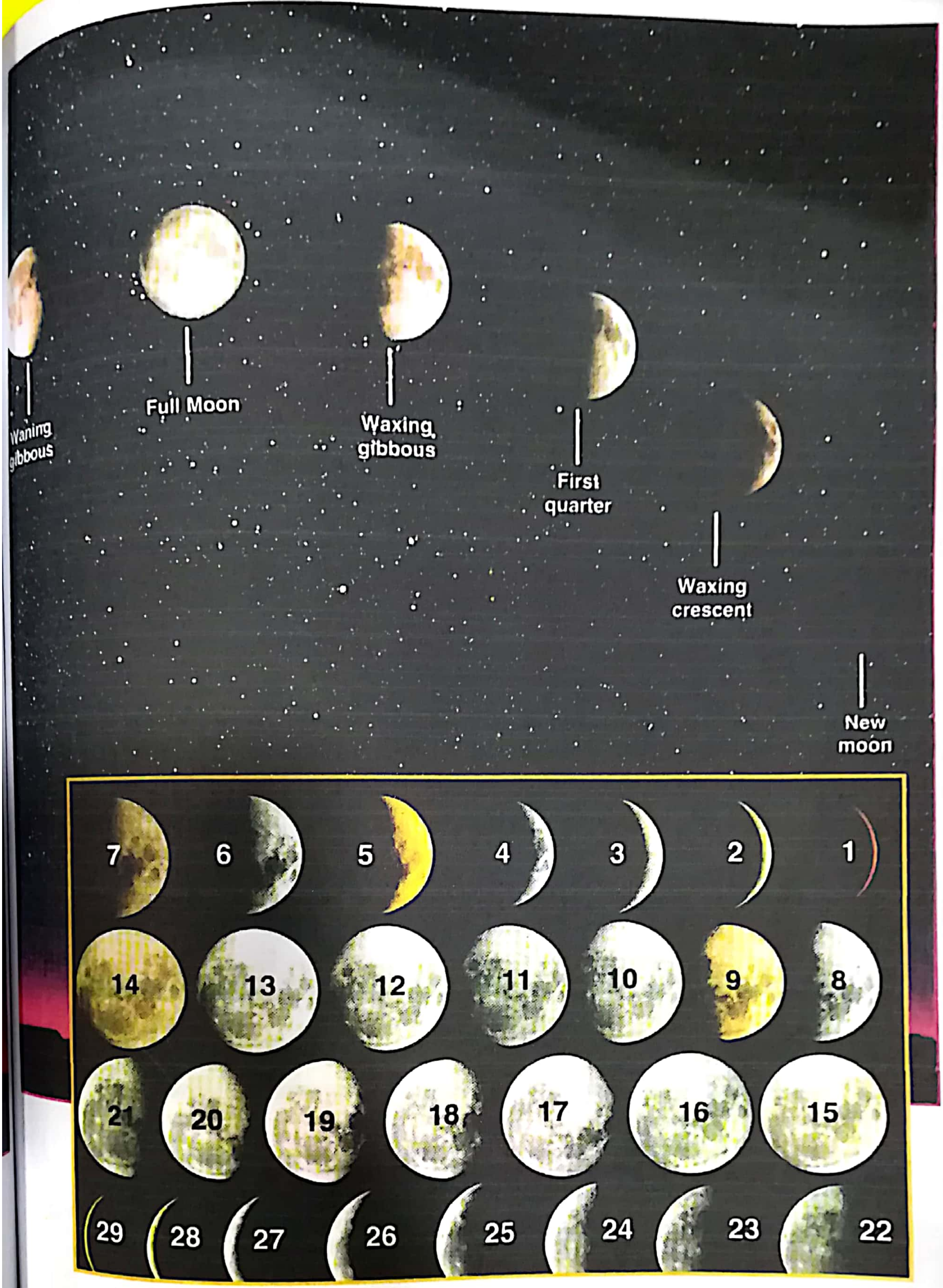
The moon's orbit around Earth.

Phases of The Moon

The moon in its orbit seems to change shape. **Moon phases** are the different shapes the moon appears to have in the sky.

- At the beginning, we don't see the moon and we call the moon in this phase the new moon.
- After about two days, we see a thin lighted part of the moon. We call this phase the crescent moon.
- About one week after the new moon, we see the moon like a half circle. We call this phase the first quarter.
- About two weeks after the new moon, we see the moon like a full circle. We call this phase the full moon.
- Three weeks after the new moon, we see the moon like a half circle again. We call this phase the third quarter.
- Four weeks (29.5 days), after the new moon, the moon is back to the phase of the new moon, where nothing of the moon's surface is lighted.

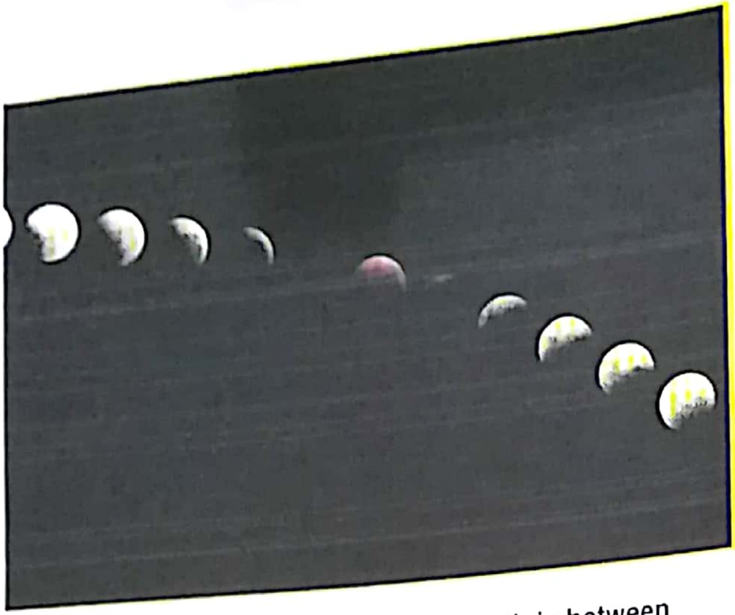
✓ **What are the phases of the moon?**



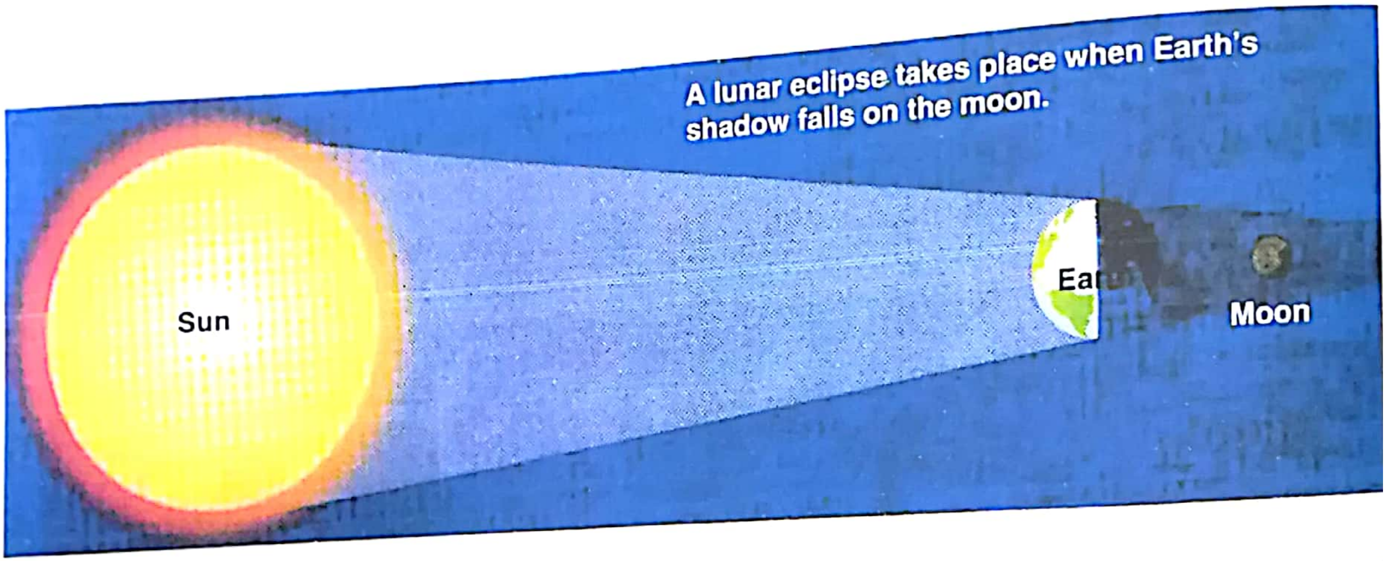
▲ The picture shows how the shape of the moon changes as we see it from Earth, from the beginning to the end of the lunar month.

Eclipses of the Moon and the Sun

You know now that the moon revolves around Earth. At times, Earth is between the sun and moon. If the sun, Earth, and moon are in a straight line, Earth blocks sunlight from reaching the moon, and the moon gets dark for some time. This is called a **lunar eclipse**.



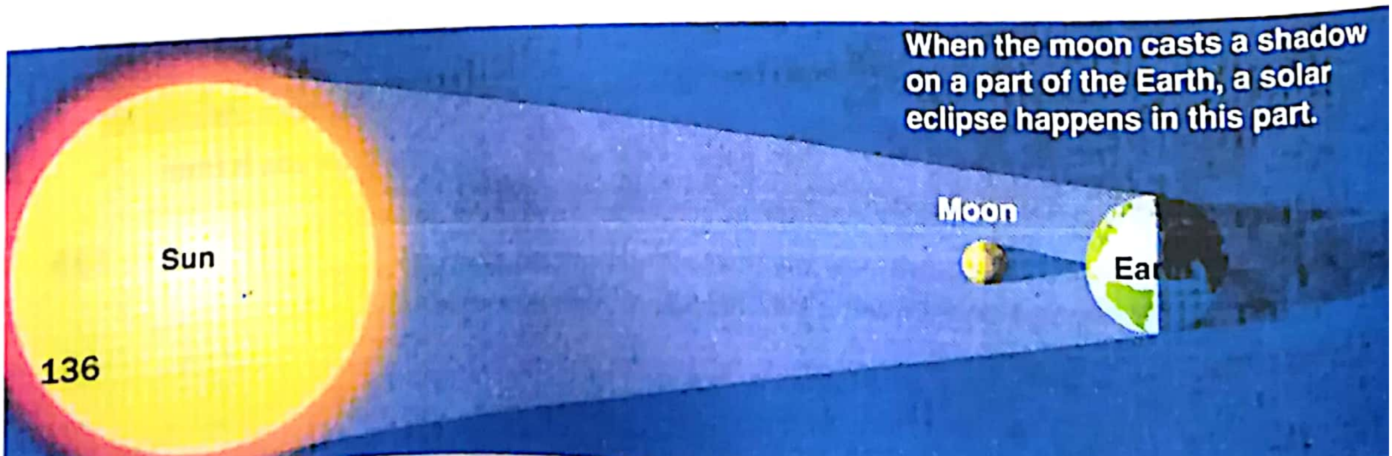
▲ A lunar eclipse happens when Earth is between the sun and the moon, and all three are in a straight line. The picture shows a lunar eclipse.



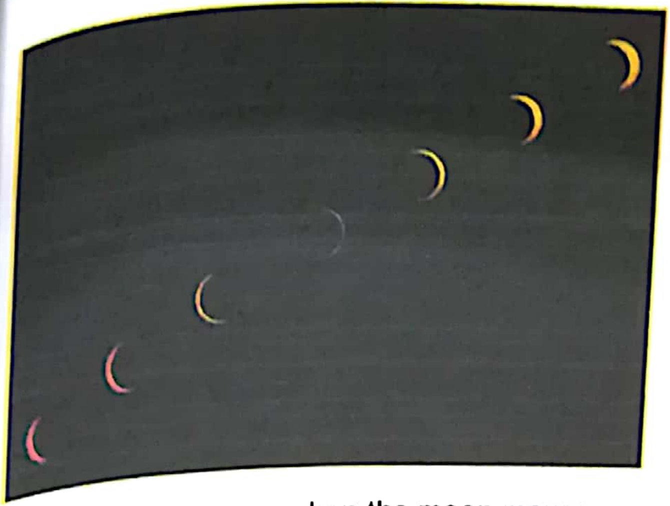
A lunar eclipse takes place when Earth's shadow falls on the moon.

At other times, the moon is between Earth and the sun. If the Earth, moon, and sun are in a straight line, the moon blocks sunlight from reaching the Earth. This is called a **solar eclipse**.

✓ What causes lunar and solar eclipses?



When the moon casts a shadow on a part of the Earth, a solar eclipse happens in this part.



▲ Solar eclipse happens when the moon moves between Earth and the sun and all three are in a straight line. This photo shows a solar eclipse.

Summary

The source of moon light is the sun. There are craters on the moon's surface. It takes the moon about 29.5 days to rotate around Earth. Phases are the different shapes the moon seems to have in the sky. Lunar eclipse happens when Earth blocks sunlight from reaching the moon. Solar eclipse happens when the moon blocks sunlight from reaching a part of the Earth.

Review

1. How did craters form on the moon?
2. Describe a new moon.
3. Compare and contrast a lunar and a solar eclipse.
4. During which phase of the moon does solar eclipse happen? Explain.
5. **Test Prep** Which of the following is NOT a phase of the moon?

A new moon C crescent
B full moon D eclipse

LINKS

MATH LINK

Estimate Elapsed Time

Sketch the shape of the moon each night for one month. Start with the new moon. How much time does it take for all eight phases to take place? Predict the date of the next new moon.

WRITING LINK

A Story

Imagine travelling in space and landing on the moon, where you spend one day. Write a story to a friend living in another country, describing the surface of the moon, and how the shape and color of Earth appeared to you. Describe also the rise of planet Earth as seen from the moon's surface.

CHAPTER 3 Review and Test Preparation

Vocabulary Review

Use the terms below to complete the sentences 1 through 9. The page numbers in ( ) tell you where to look in the chapter if you need help.

solar system (126)
planet (126)
moon (126)
orbit (126)
star (128)
constellation (128)
moon phases (134)
lunar eclipse (136)
solar eclipse (136)

1. A large body of rock or gas that orbits the sun is a ____ .

2. The moon has ____ that make it seem to change shape.

3. The ____ is made up of the sun and all the objects that orbit the sun.

4. An ____ is the path of an object as it moves around another object in space.

5. The ____ is a large ball of rock that moves around Earth.

6. When Earth blocks sunlight from reaching the moon, a ____ happens.

7. When the moon blocks sunlight from reaching a part of the Earth a ____ happens.

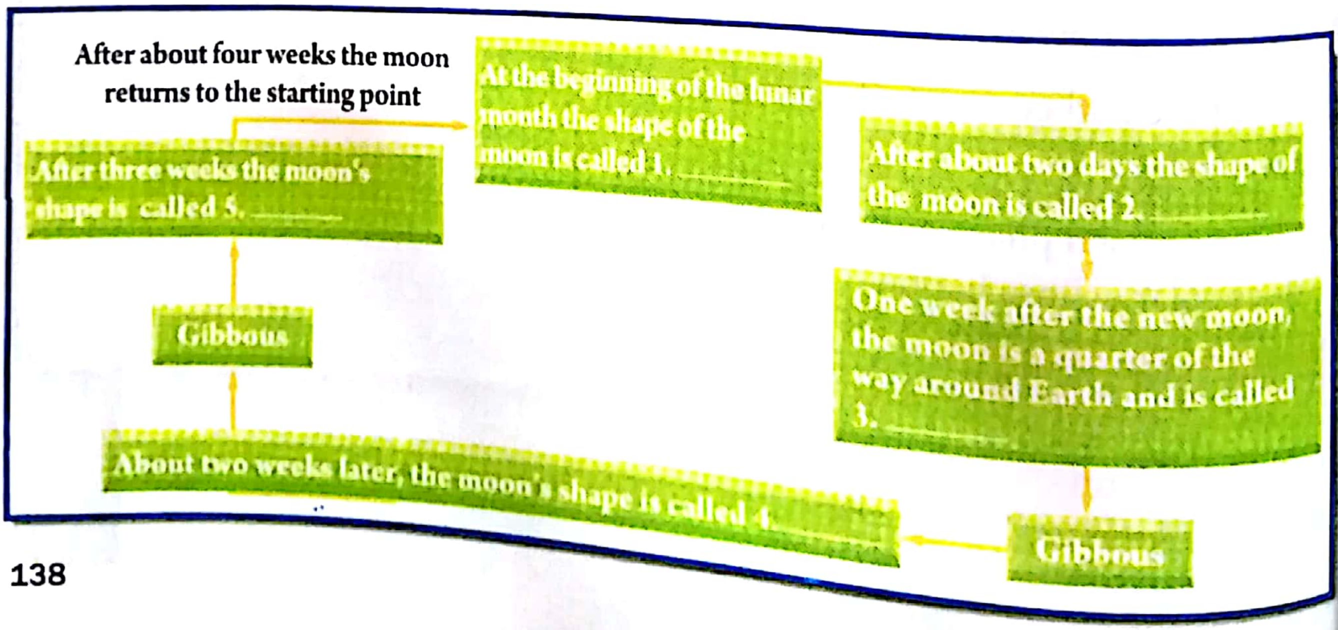
8. A ____ is a group of stars that have a distinctive shape.

9. A ____ is a huge ball of glowing gases.

Connect Concepts

The movements of Earth and the moon cause changes in the shape of the moon. Use the terms in the word bank to fill in the concept map and complete each sentence.

crescent
third quarter
first quarter
full moon
new moon



At the beginning of the lunar month the shape of the moon is called 1. ____

After about two days the shape of the moon is called 2. ____

One week after the new moon, the moon is a quarter of the way around Earth and is called 3. ____

Gibbous

About two weeks later, the moon's shape is called 4. ____

Gibbous

After three weeks the moon's shape is called 5. ____

After about four weeks the moon returns to the starting point

Check Understanding

Write the letter of the best choice.

1. Stars are huge balls of ____
   A solid bodies
   B hot liquids
   C glowing gases
   D cold gases

2. When the moon looks like a lighted circle in the sky, it is in the ____ phase
   A full moon
   B new moon
   C crescent moon
   D gibbous moon

3. The full rotation of the moon around Earth takes ____
   A two days
   B about 29.5 days
   C about 19 days
   D about three days

The moonlight comes from ____
A distant stars
B Sun
C Earth
D air

nswer the following two questions.

Describe the phases of the moon.

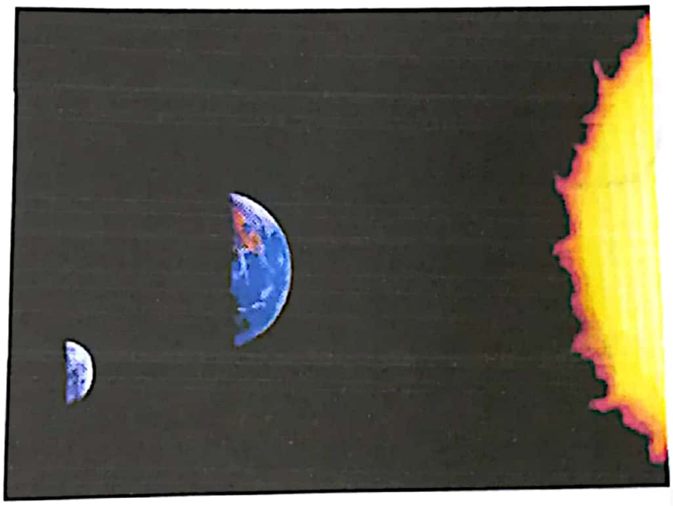
When the moon is in the new moon phase, it is located beween the sun and earth. Why doesn't the solar eclipse happen?

Process Skills Review

1. **Compare** lunar and solar eclipses. How are they alike? How are they different?

Performance Assessment

1. The moon takes 29.5 days to revolve around Earth. During its revolution, its shape changes. Choose three photos of the moon from pages 134 and 135. For each of these photos, draw a diagram that shows the location of Earth, the sun, and the moon as shown in the figure below.



2. Find out why large planets seem small planets from Earth. Hold a ball close to your eyes, then move it away slowly. The size of the ball seems to change. Why do you think this happens?

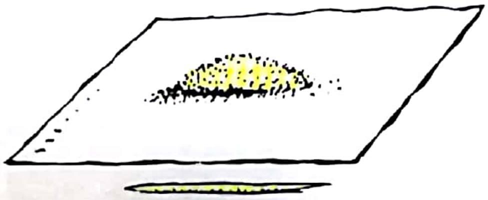
ACTIVITIES FOR HOME OR SCHOOL

MINERALS IN SAND

What minerals are found in sand?

Materials

- sand
- sheet of paper
- hand lens
- toothpick
- written properties of some minerals



Procedure

1. Spread the sand on a sheet of paper.
2. Observe the colors and shapes of the sand grains with the hand lens. Each type of sand grain has a different color and shape.
3. Use the toothpick to move the grains of each mineral into a separate pile.

Draw Conclusions

Identify the minerals using the properties your teacher gave you. Which mineral is the most common in sand?

MAKING RAINDROPS

Why do raindrops fall?

Materials

- dropper
- water
- clear plastic coffee-can lid
- pencil

Procedure

1. Fill the dropper with water.
2. Turn over the lid and place it on the table. Drop small drops of water onto the lid. Put as many drops as you can on the lid without letting them touch.
3. Quickly turn the lid over.
4. Hold the lid upside down and move the drops together with the pencil point. What happens?

Draw Conclusions

How is this similar to what happens in the clouds?

Physical Science

UNIT 3 PHYSICAL SCIENCE

CHAPTER 1 Properties and Changes of Matter 144

CHAPTER 2 Heat 166

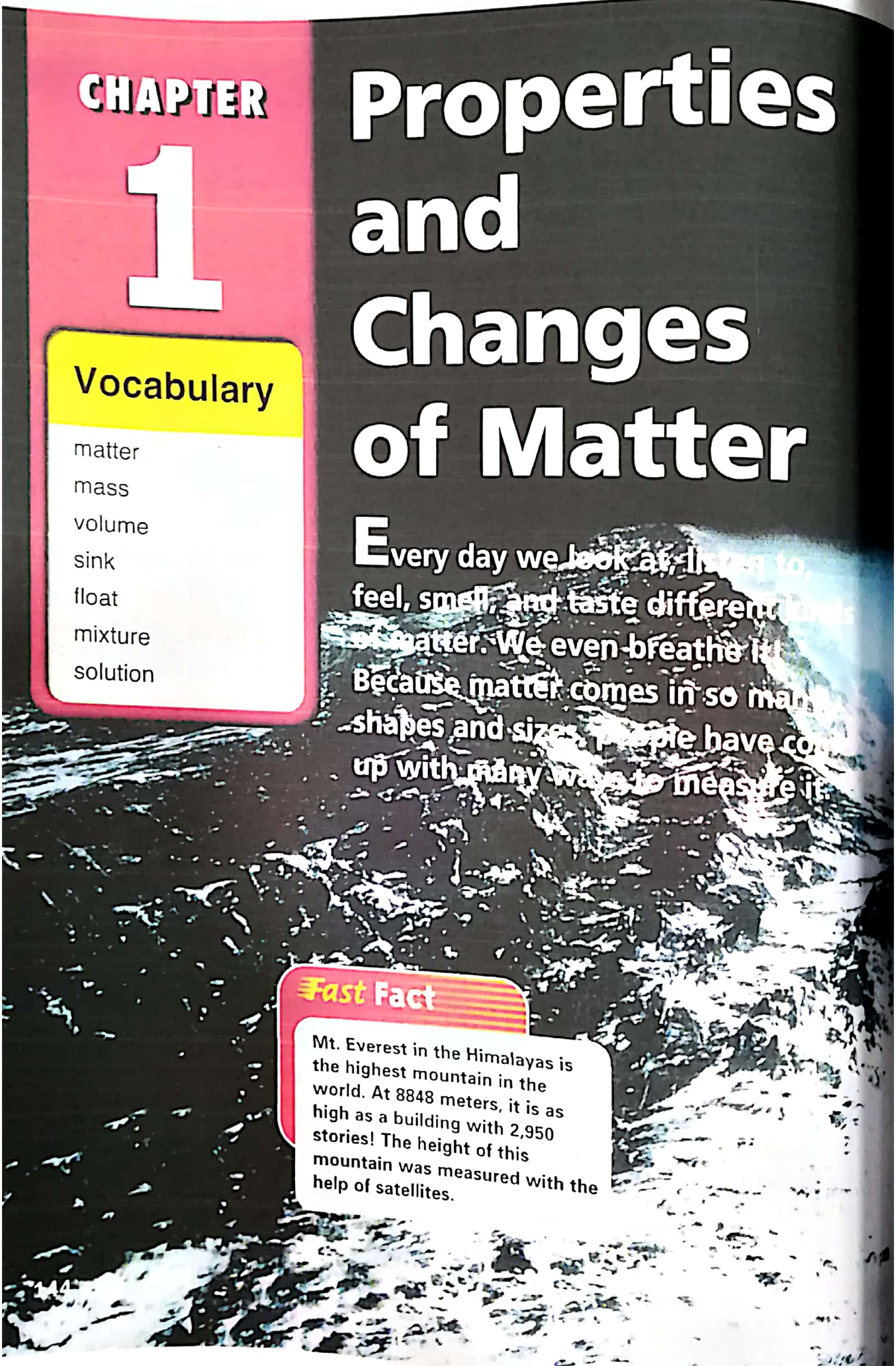
CHAPTER 3 Forces and Motion 182

Activities for Home or School 200

UNIT EXPERIMENT

Freezing Point of Water

Pure water freezes at 0°C. While you study this unit, you can conduct a long-term experiment to find out how other substances affect the freezing point of water. Here are two questions to think about. Can the freezing point of water be lowered by adding something to water? Can the freezing point of water be raised by adding some other substance to water? Plan and conduct an experiment to find answers to these or other questions you may have about the freezing point of water.



CHAPTER

1

Properties and Changes of Matter

Vocabulary

- matter
- mass
- volume
- sink
- float
- mixture
- solution

Every day we look at, listen to, feel, smell, and taste different kinds of matter. We even breathe it! Because matter comes in so many shapes and sizes, people have come up with many ways to measure it.

Fast Fact

Mt. Everest in the Himalayas is the highest mountain in the world. At 8848 meters, it is as high as a building with 2,950 stories! The height of this mountain was measured with the help of satellites.

Fast Fact

Our senses help us observe and describe matter. Dogs are famous for their sense of smell. Bloodhounds can use their sense of smell to follow a trail more than 185 km long and 100 hours old.

Type of Animal	Best Smeller
Insects	Silkworm moths
Fish	Sharks
Mammals	Elephants
Amphibians	Newts
Birds	Albatrosses
Reptiles	Snakes and lizards

LESSON 1

What Are Properties of Matter?

In this lesson, you can . . .

INVESTIGATE how to measure the volume of a liquid.

LEARN ABOUT some properties of matter.

LINK SCIENCE to math and writing.

The liquid appears to have different volumes in containers of different shapes. This is not correct.

INVESTIGATE

Measuring the Volume of a Liquid

Activity Purpose When you pour the same quantity of liquid in containers of different shapes, you see that the shape of liquid differs taking the shape of the container. In this activity, you see how the height of the liquid varies in containers of different shapes

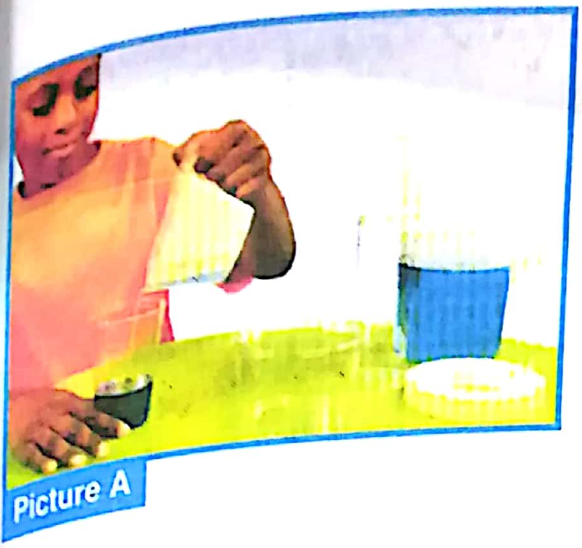
Materials

- metric measuring cup
- metric ruler
- 3 clear plastic containers of different shapes
- colored water
- masking tape

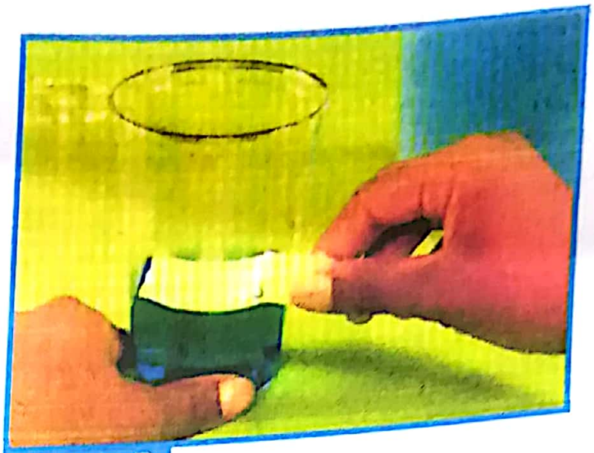
Activity Procedure

① Measure 100ml of colored water.

② Pour the colored water into a clear container. (Picture A).



Picture A



Picture B

3. Use a piece of masking tape to mark the level of the water in the container. Put the upper edge of the tape at the water line. (Picture B).

4. Use the ruler to **measure** the height of water level in the container. **Record** your measurement in the table.

5. Repeat steps 1-4 for the other two containers.

Height of Colored Water in Each Container (in cm)

First Container	Second Container	Third Container

Draw Conclusions

1. What is the volume of water in each container?
2. Describe the height of water in each container. Why does the height of water differ in the containers?
3. **Scientists at Work** Scientists use data and **observations** to **predict** what will happen. What do you **predict** will happen if you pour the water from each container back into the measuring cup.

Process Skill Tip

Scientists use data and **observations** to **predict** what will happen in given circumstances.

LEARN ABOUT

Properties of Matter

FIND OUT

- about matter
- about some properties of matter and how they are measured

VOCABULARY

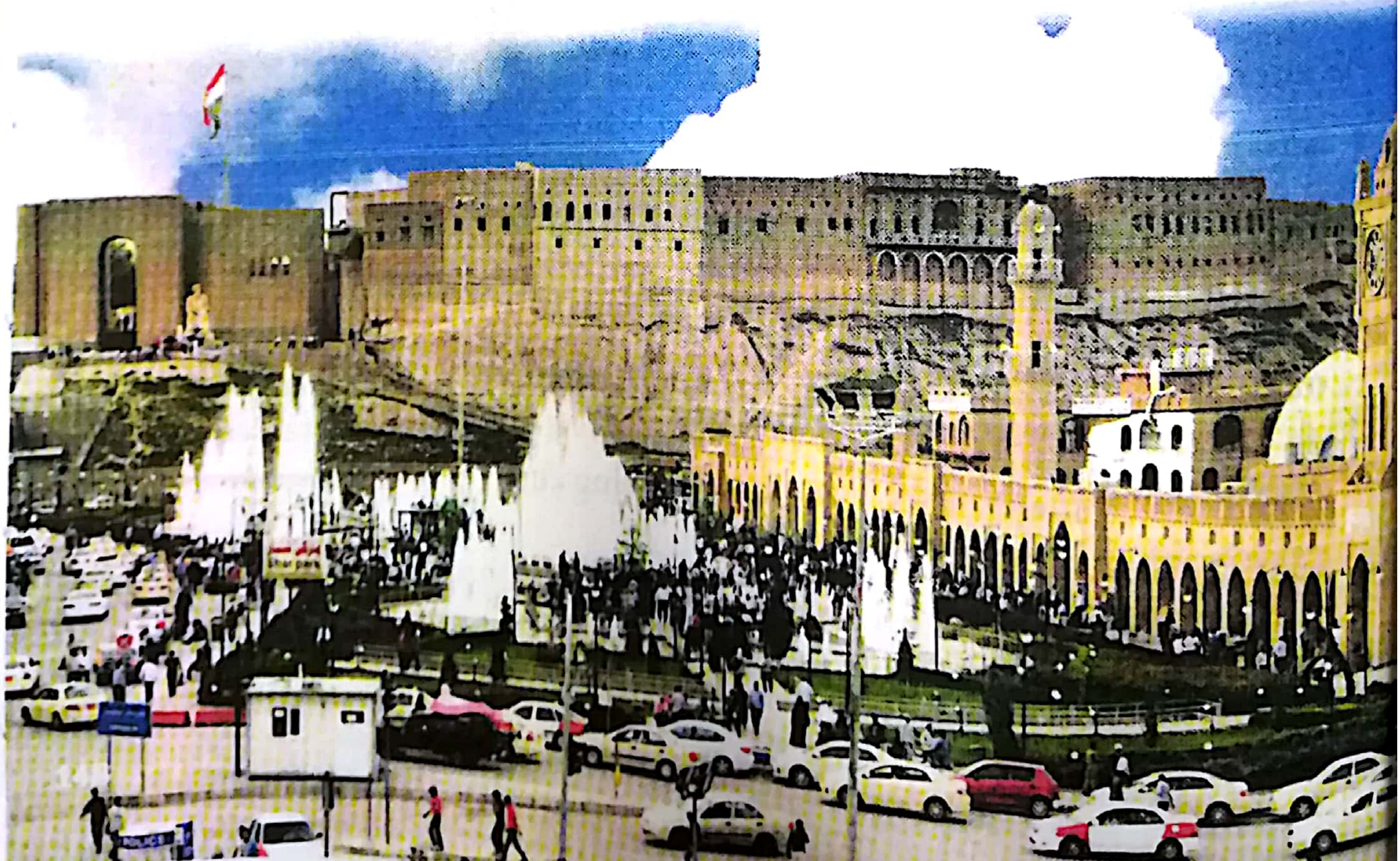
matter
mass
volume
sink
float

Matter

Look around your classroom. You may see desks, books, other students, and the teacher. Everything you see takes up space. Your classroom must have enough space to hold you and all the other things that are in it. Everything in the classroom is matter. **Matter** is anything that takes up space. Water, air, and clouds are matter. Even you are matter.

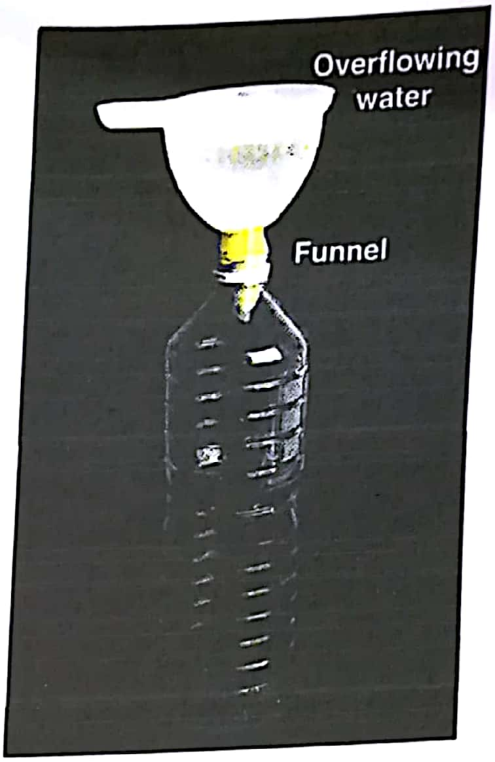
✓ **What is matter?**

▼ What things in the picture are matter?

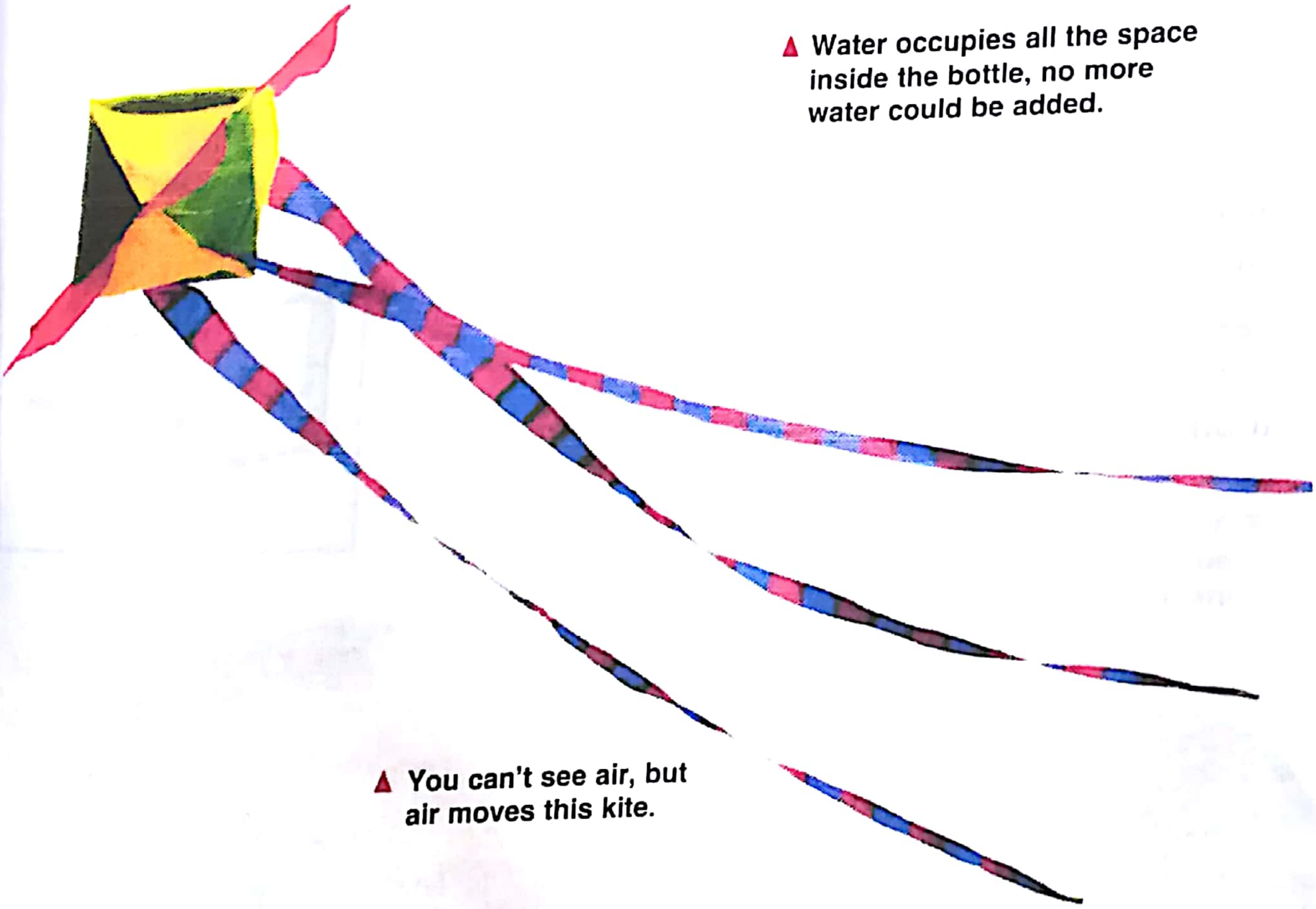


Since matter takes up space, no two objects can occupy the same space at the same time. You can not add water to a container which is already filled with water. Look outside. Is it raining? Is it sunny? Rain and sun are two types of matter. Is the wind blowing? Air is matter that you can't see. How do you know that air is matter? Air takes up space. You can see that air takes up space when you blow up a balloon. You can see air move the leaves of trees or move a kite.

✓ **Why is air a form of matter?**



▲ Water occupies all the space inside the bottle, no more water could be added.



▲ You can't see air, but air moves this kite.

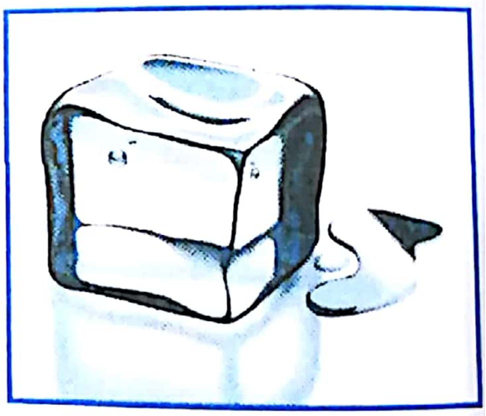
Senses and Properties of Matter

A property of matter is anything that you can observe about matter using one or more of your senses.

If you use your sense of sight to observe a chick, you'll see that it is small and yellow. You are observing the size of the chick and its color. If you use your sense of hearing, you may hear drums when they bang, wind when it blows, or bells when they ring. Using the sense of touch, you can feel that the ice cube is cold, smooth, and hard, while sand paper is rough. Using the sense of smell, you can feel the nice smell of roses or the bad smell of rotten eggs. When you use your sense of taste, you may taste sweet, salty, or bitter food.

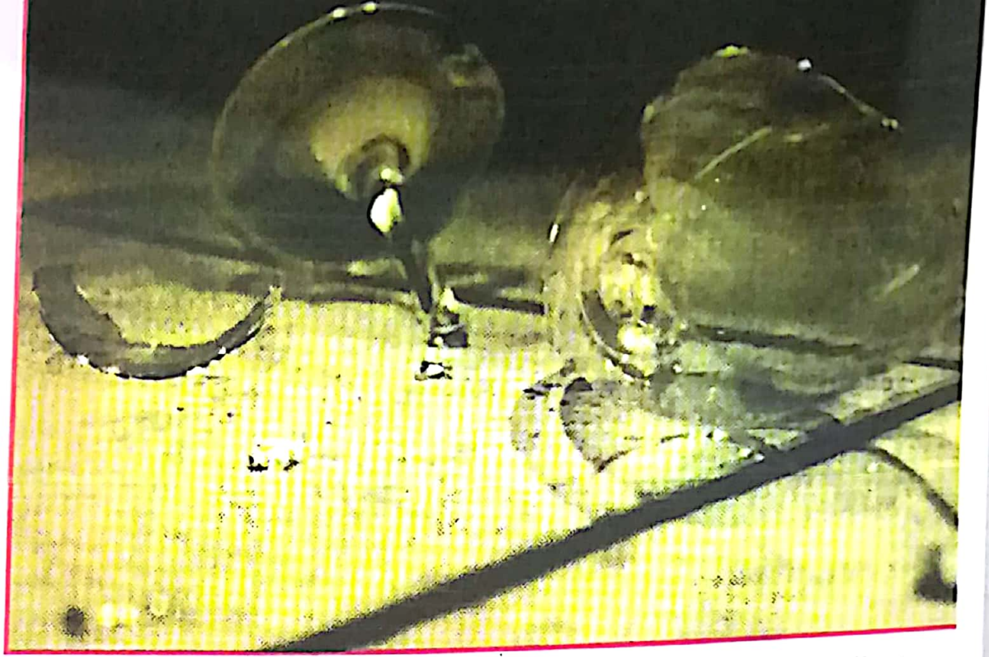
▲ A chick is small and yellow.

Ice is cold, smooth, and hard. ►



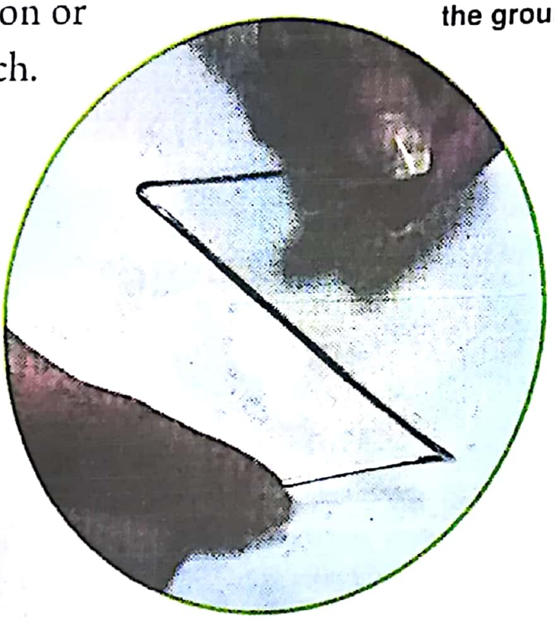
▼ An apple is smooth from the outside and sweet from the inside.

A rose has a nice smell. ▼



▲ Many things break when they fall on the ground. Glass is one of them.

Color, size, and texture are properties of matter. Matter also has other properties that you can see, hear, or feel. Rubber, for example, bounces when it falls on the ground while glass will break. The length of a rubber band increases when you stretch it, while cotton or wool threads don't stretch. Salt dissolves in water while sand doesn't. A paper clip can be bent easily while a plastic ruber will break if you try to bend it.

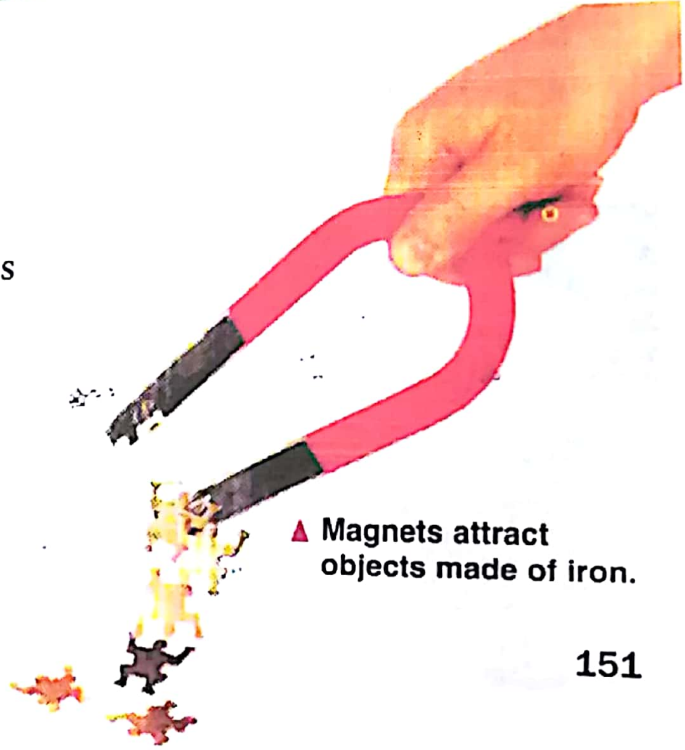


◀ You may easily bend a paper clip.

Magnets can attract objects made of iron but not of copper.

These are some examples of the properties of matter. Think of other properties of matter that you find in your classroom.

✓ **List two properties of bananas.**

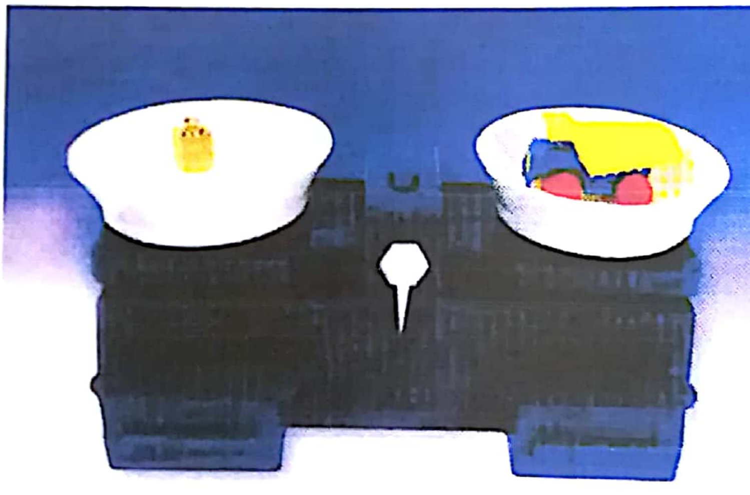


▲ Magnets attract objects made of iron.

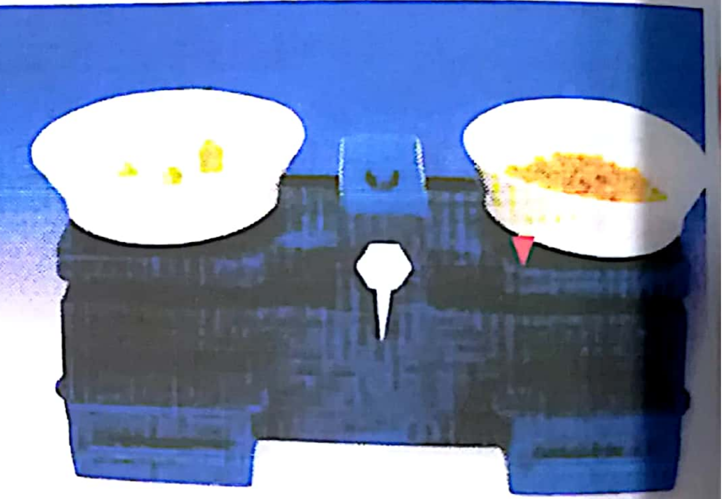
Measuring Matter

Another property of matter that could be measured is mass. **Mass** is the amount of matter in something. You can measure mass by using a balance. Mass is often measured in grams (g) or kilograms (kg). One kilogram equals 1000g.

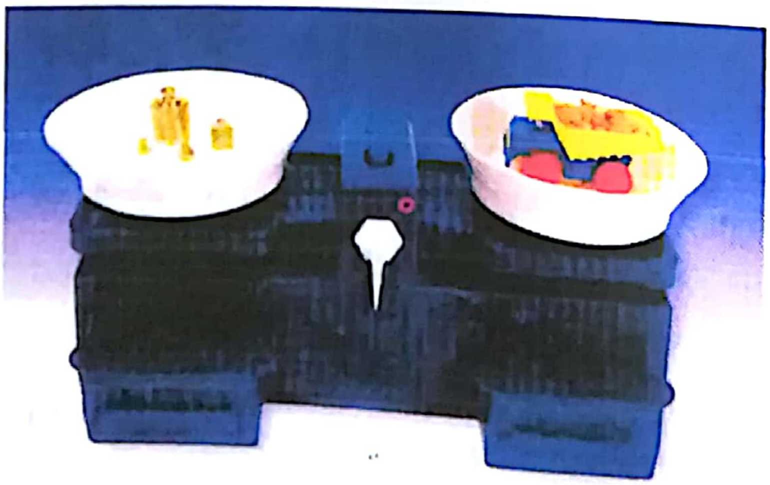
Suppose you have small apple slices. You know their mass. You also have some orange slices that you know their mass. You mix them together to make a fruit salad. How can you find the mass of the salad without using a balance? If you say “I add the two masses”, then your answer is correct. The total mass of two or more things together is the sum of their individual masses.



▼ The mass of the toy car is 50 grams.



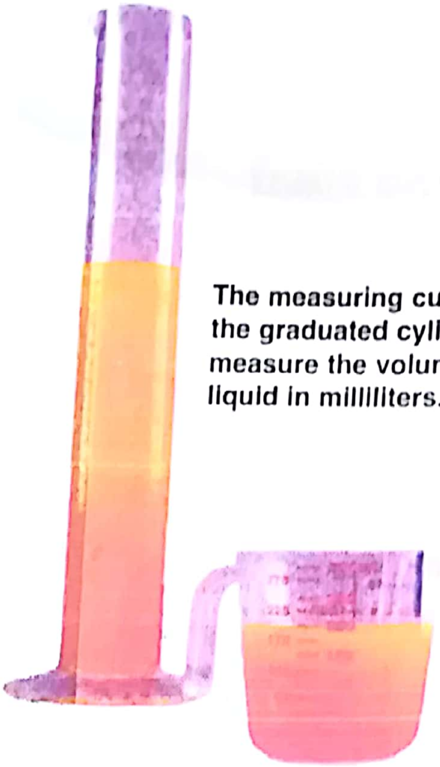
▼ The mass of the raisins is 14 grams.



◀ The mass of the toy car and the raisins is 64g. That is the sum of the two masses added together.

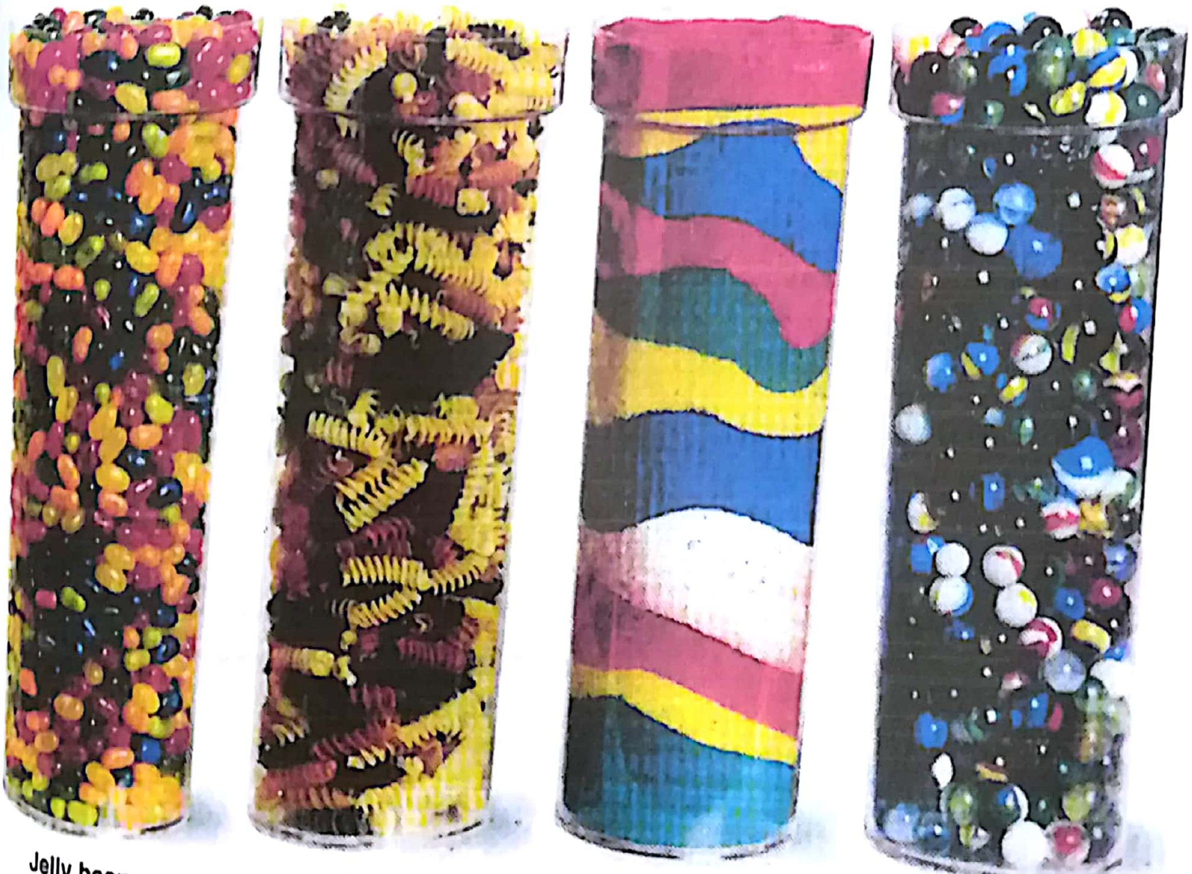
Another physical property of matter is volume. Scientists measure volume using special tools. The volume of a liquid is measured using a measuring cup or a graduated cylinder. **Volume** is the amount of space matter takes up. Volume is measured in milliliters (ml) or liters (l). One liter equals 1000ml. In the previous activity, you measured 100ml of colored water. The volume of colored water in the measuring cup was 100ml.

✓ **What is volume?**



The measuring cup and the graduated cylinder measure the volume of liquid in milliliters.

All the jars are filled. They have the same volume of matter in them. But look closely at the matter in each jar. Each kind of matter has a different mass. The jelly beans have more mass than the pasta. The sand has more mass than the marbles.



Jelly beans

Pasta

Sand

Marbles

Sink and Float

If you put an object in water, it could sink or float. An object **sinks** in water when it falls to the bottom, and **floats** on water when it stays on the surface. How well an object floats or sinks is a property of objects.

Wood always floats on the surface of water , while iron sinks in some cases and floats in others. An iron nail sinks in water, while a ship made of iron floats. To tell whether objects sink or float, we have to carry out experiments.

✓ **How can you tell whether an object floats on the surface of water?**

Summary

Matter is everything that takes up space. Matter has properties like color, shape, texture, taste, smell, floating, and sinking. Properties of matter can be investigated using our senses.

Mass and volume are two properties of matter that can be measured. Mass is the amount of matter in an object. Volume is the space matter takes up.

Review

1. What is matter?
2. What is mass?
3. How can we learn about the properties of matter?
4. Name two types of fruits. Which one has a larger mass? Explain.
5. **Test Prep** Which set of words all name properties of matter?

A solid, liquid, gas
B ice, water, steam
C hard, soft, sticky
D rocks, rubies, floats

LINKS

MATH LINK

Measure Volume

Fill a clear film canister to the brim with water, and put the lid on. Measure the height of the canister. Then freeze it. After three hours, measure the height of the ice in the canister. What happened to the volume of water? What is the relation between volume and the new state of the water?

WRITING LINK

Explanation

Suppose you have gone shopping for groceries only to discover that the grocer did not have the standard weights to weigh your purchases. Write a short story that explains what you would have to do to weigh your groceries.

LESSON 2

How Does Matter Change?

In this lesson, you can . . .

INVESTIGATE how to separate mixtures.

LEARN ABOUT two changes in matter.

LINK SCIENCE to math and social studies.

INVESTIGATE

Separate a Mixture

Activity Purpose In a mixture of sand, shells, twigs, and pebbles, you could easily separate the shells with your hands. To separate other mixtures, you might need to use different methods or tools. **Plan and conduct an investigation** to discover methods for separating mixtures.

Materials

- 4 clear plastic cups
- water
- rice
- measuring cup
- funnel
- 6 marbles
- steel paper clips
- magnet
- paper towels

Activity Procedure

① In one cup, make a mixture of marbles and water. Plan a way to separate the marbles from the water. Try it. **Record** your method and results.

The kinds of matter in a mixture of peanuts, hazelnuts, almonds, and chickpeas, do not change after mixing.

2. In another cup, make a mixture of marbles, paper clips, and rice. Plan a way to separate the mixture. Try it. **Record** your method and results.

3. If your method doesn't work, plan a different way to separate the mixture. Try different methods until you find one that works. Try using the magnet. **Record** each method you try and the results.

4. In another cup, mix a quarter cup of rice with 1 cup of water. How could you separate the rice from the water? **Record** your ideas.

Picture A

5. Make a filter using the paper towels and funnel. **Predict** how this tool could be used to separate the mixture. Then use the filter to separate the mixture. (Picture A)

Draw Conclusions

1. When would it be enough to use only your hands to separate a mixture?
2. When might you need a tool to separate a mixture?
3. **Scientists at Work** Scientists often use charts to **record** the results of their investigations. How would setting up charts help you **plan and conduct an investigation**?

Process Skill Tip

Scientists have questions about the world around them. To find the answers, scientists **form hypotheses** and then **plan and conduct experiments** to test the hypotheses. Often, their hypotheses are incorrect. When that happens, scientists revise their hypotheses, then plan and conduct new experiments.

LEARN ABOUT

Two Changes in Matter

Changes That Don't Form New Kinds of Matter

FIND OUT

- how matter can change and still be the same
- about mixture and solution
- how new kinds of matter form

VOCABULARY

mixture
solution

When you wash your clothes they become soaked and their shapes change, otherwise your clothes will remain the same. Some changes make things look quite different. We can tear sheets of paper, paint them, write on them and stick them together. Each time the sheets look different but they are still paper.

Heating changes ice into liquid water. Cooling makes liquid water change to ice. No new kinds of matter are formed. Vapor, water and ice are all made of the same matter.

Cutting the wool of sheep, spinning the wool into threads and knitting the woollen threads into clothes, are examples of changes of this kind. The wool looks different, but it is still wool. It is the same kind of matter.

✓ **What are some ways that matter can change and still be the same matter?**

▼ Sheep grow a thick coat of wool.

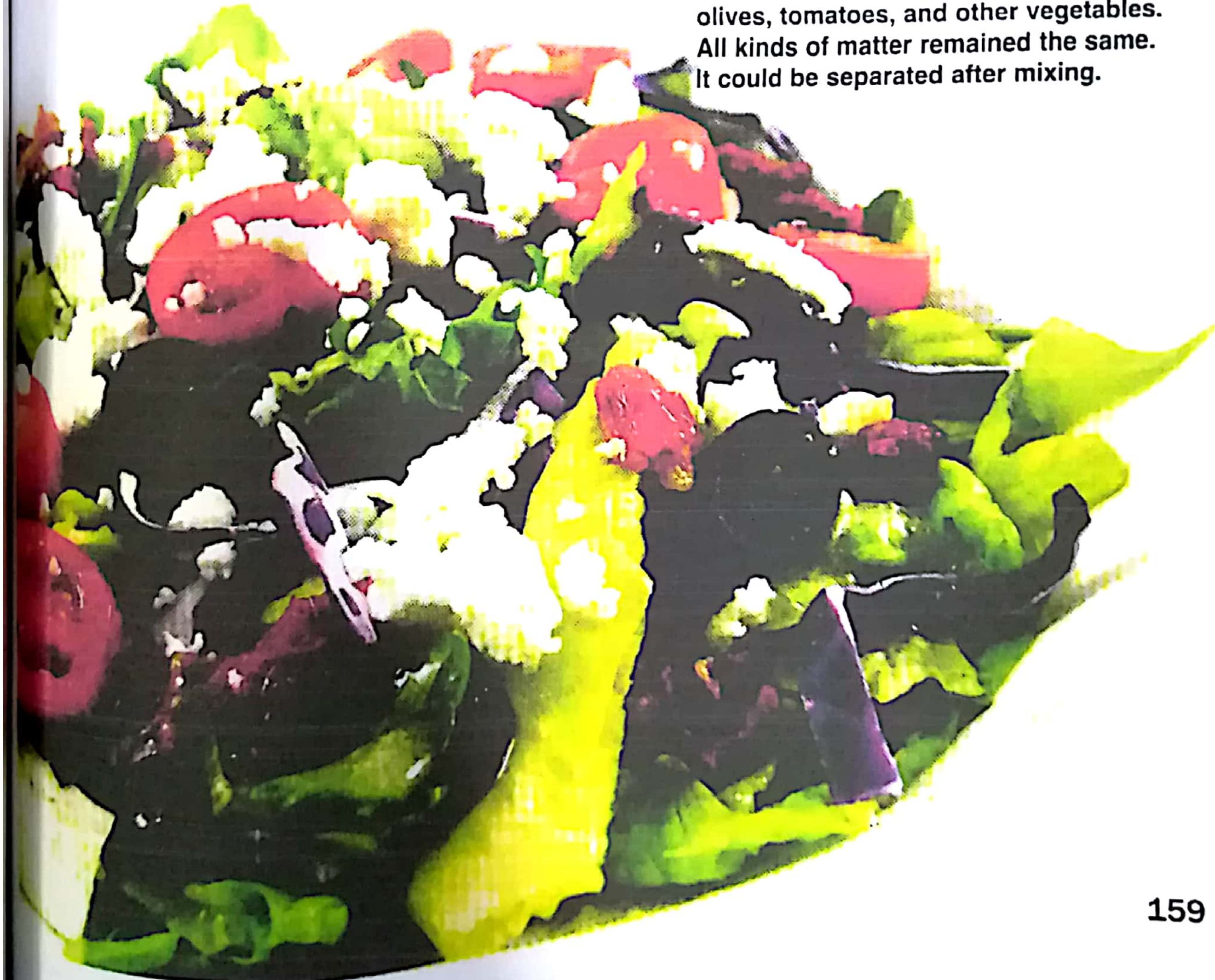
◄ Wool is spun into threads.

Mixtures

A **mixture** is a mix that contains two or more different kinds of matter. No change of matter takes place when a mixture is formed. No change of shape or taste takes place. You are putting different kinds of matter together, but not making new kinds of matter.

The kinds of matter in a mixture can be separated. After a mixture is separated, the matter is the same as it was before it was mixed. In the investigation you made a mixture of rice, paper clips, and marbles. Then you separated the pieces back into separate piles of rice, paper clips, and marbles. Some mixtures can be separated by hand. You separated the rice from the marbles with your hands. Some mixtures can be separated by evaporation or by condensation. In *evaporation* the liquid part of a mixture turns into a gas. This leaves the other part behind. In *condensation* the gas in a mixture turns into a liquid. The liquid can be separated from the rest of the mixture.

✓ **What is a mixture?**



▼ This dish contains a mixture of cheese, olives, tomatoes, and other vegetables. All kinds of matter remained the same. It could be separated after mixing.

Solutions

Have you ever put sugar in your tea? After you stir the tea, you can't see the sugar anymore. You know the sugar is still there because you can taste it. Sugar has dissolved in the tea. This mixture of sugar and tea is called a solution. In a **solution** different kinds of matter are mixed together evenly.

The different kinds of matter in a solution can't be separated by hand. But evaporation can separate some solutions. If you heat the tea or leave the glass out for some time, the water in the tea will evaporate and the sugar will be left over.

✓ **What is a solution?**

▼ Lemonade is a solution made up of lemon juice, water, and sugar.

Changes That Form New Kinds of Matter

Some other changes form new kinds of matter.

Cooking often forms new kinds of matter. When flour, eggs, milk, and oil make a cake, new matter is formed. The cake will never be eggs, flour, milk, and oil again.

Burning Burning something means setting something on fire. People burn lots of things everyday. They burn gas to cook food. Engines of cars and buses burn fuel to move. When things burn, new kinds of matter form. When wood is burnt, new kinds of matter are formed consisting of ashes and smoke. Ash and smoke can never be wood again.

▼ When bread is baked in the oven, a new kind of matter is formed.

▼ When wood is burnt, new kinds of matter are formed. Ash is one of them. Ash doesn't look like wood.

Rusting If you leave a piece of iron exposed to moist air, you shall observe after some time that brown spots have formed on the iron. This brown substance is rust. Rust is a kind of matter unlike iron. It is not strong like iron. When iron rusts, it loses some of its strength. You can often remove the rusty parts off.

✓ **Give two examples of changes that form new kinds of matter.**

▼ The new bolt is shiny. The other bolts are old, The iron in the old bolts has rusted. It has combined with air and water to form a new kind of matter.

Summary

Matter can change size, shape, and state. Matter can be mixed. These changes of matter don't form any new kinds of matter. A mixture contains two or more kinds of matter that could be separated again. A solution is a kind of mixture. In a solution different kinds of matter are mixed evenly. Some changes like burning, rusting, and cooking form new kinds of matter.

Review

1. Name three changes in matter that don't form new kinds of matter.
2. What is the difference between a mixture and a solution?
3. Name two known changes that form new kinds of matter.
4. Suppose you have a solution of water and salt. You use evaporation to separate salt from water. Where does the water go?
5. **Test Prep** Which one is a solution?

A different types of marbles mixed together
B sugar mixed with water
C clay, rocks, and twigs
D rice mixed with water

Mixture ▶

LINKS

MATH LINK

Solve a Problem

To prepare 1 liter of lemonade, we need 1 cup of lemon juice and 4 cups of water. How many cups of water are needed to prepare 3 liters of lemonade?

SOCIAL STUDIES LINK

Salt Extraction

In some countries, salt is extracted from sea water. Learn how salt is separated from water in these countries.

CHAPTER 1 Review and Test Preparation

Vocabulary Review

Use the terms below to complete the sentences 1 through 6. The page numbers in ( ) tell you where to look in the chapter if you need help.

matter (148)
mass (152)
volume (153)
sinks (154)
floats (154)
mixture (159)
solution (160)

1. ____ is matter that consists of two or more things that could be separated.

2. An object ____ when it falls to the bottom of water.

3. An object ____ when it stays on the surface of water.

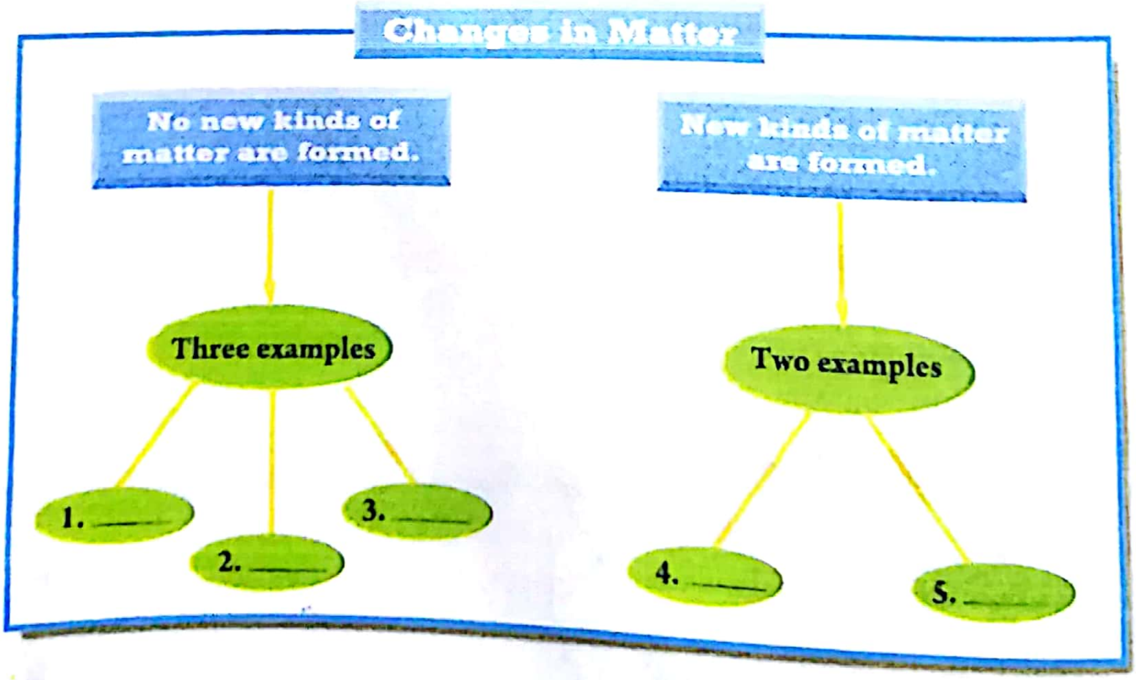
4. ____ is a mixture in which different kinds of matter mix together evenly.

5. ____ is the amount of matter in an object.

6. ____ is the space that matter takes up.

Connect Concepts

Complete the diagram below by listing three examples of changes where new kinds of matter are formed, and two examples of changes where no new kinds of matter are formed. Write the terms needed to complete the concept map.



Check Understanding

Circle the letter of the best choice.

1. Which of the following forms new matter?
   - A dissolving soap in water
   - B cutting paper with a pair of scissors
   - C burning paper
   - D filling a balloon with air
2. Which of the following does not form new kind of matter?
   - A mixing blueberries, strawberries, and raspberries
   - B rusting of iron on a car
   - C burning a log
   - D cooking pancakes
3. One of the properties common to a football and a tennis ball is that they both ——
   - A have the same color
   - B have the same size
   - C have the same mass
   - D bounce when they hit a barrier
4. Which of the following is a solution?
   - A twigs, leaves, and bugs
   - B sugar and water
   - C newspapers and magazines
   - D milk and cereals
5. What new kind of matter forms when wood is burnt?
   - A earth
   - B clouds
   - C rust
   - D ash
6. Which of the following is a property of iron?
   - A breakable
   - B attracted by a magnet
   - C bounces when it hits a barrier
   - D soft

Answer the following question

7. If you leave a pickaxe out in the rain for two weeks, brown spots are formed on it. Explain what has happened.

Process Skills Review

Write *True* or *False*. If a statement is false, change the underlined words to make it true.

1. A scientist who wants to find an answer to a question **plans and conducts an investigation**.
2. When you **infer**, you make a wild guess.

Performance Assessment

Mixtures and Solutions

Work together with three or four other students. Your teacher will give you the following things: a pitcher of water, two cups, paper clips, safety pins, salt, spoon, and unpopped popcorn. Make one mixture and one solution and label each correctly.

CHAPTER

2

Heat

Vocabulary

heat
temperature
thermometer
conduction
conductor
insulator

What do you do on a cold and sunny day to feel warm? You might sit in the sun, wear woollen clothes, or sit next to a heater.In all these cases, you gain heat, or keep it.

Fast Fact

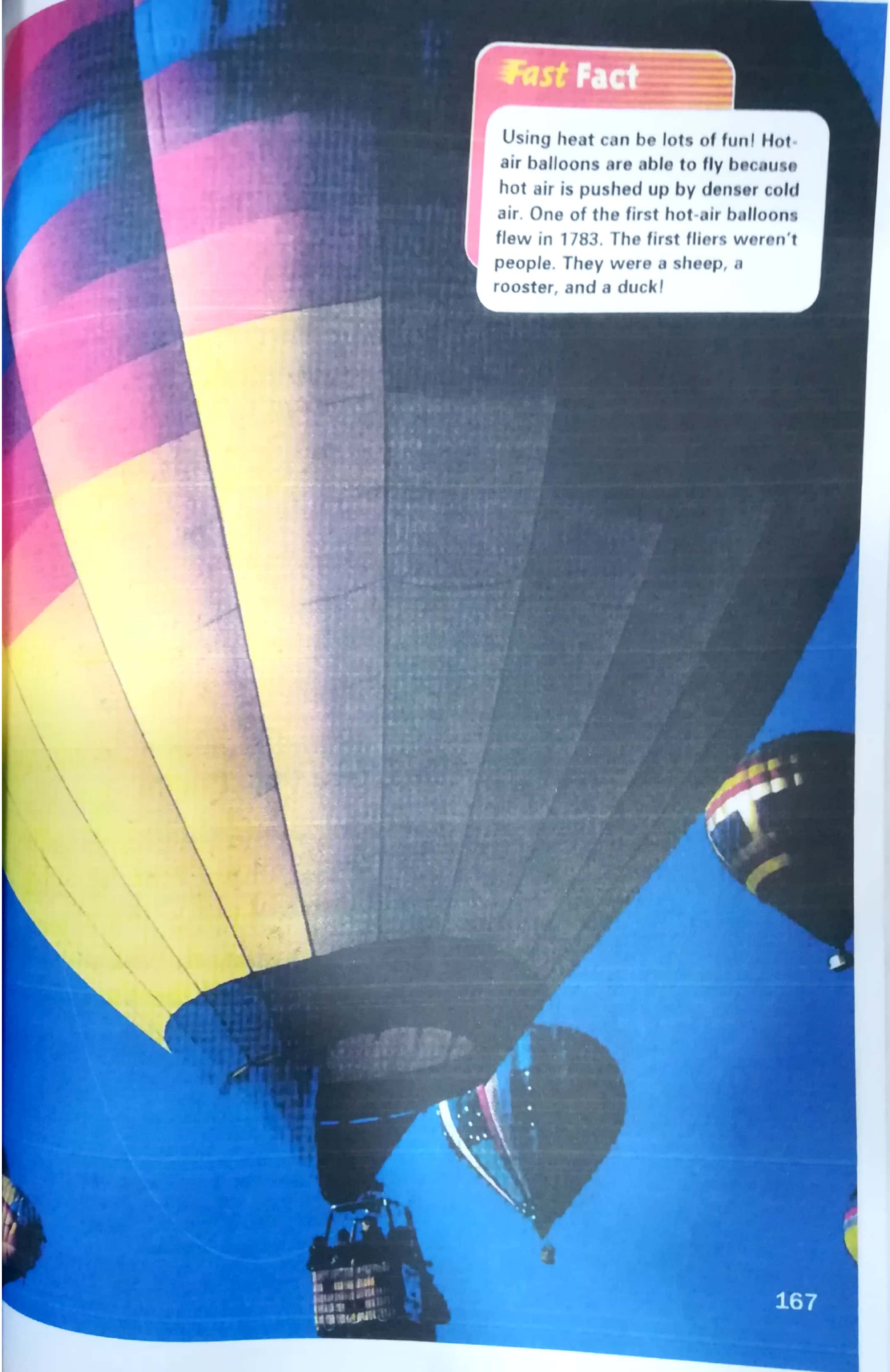
The speed of sound increases with the increase in air temperature. The following table shows the speed of sound at different temperatures.

The Speed of Sound in the Air

Temperature °C	Speed of Sound (meters per second)
0	332
5	335
15	341
25	347
40	356

Fast Fact

Using heat can be lots of fun! Hot-air balloons are able to fly because hot air is pushed up by denser cold air. One of the first hot-air balloons flew in 1783. The first fliers weren't people. They were a sheep, a rooster, and a duck!



LESSON 1

What Is Heat?

In this lesson, you can . . .

INVESTIGATE a way to get heat.

LEARN ABOUT heat and temperature.

LINK SCIENCE to math and health.

INVESTIGATE

Rubbing Objects Together

Activity Purpose Scientists use what they know to make statements about how the world works. Then they do tests to see if their statements are correct. The statements they test are called **hypotheses.** In this investigation you will make hypotheses about heat.

Materials

- metal button
- sheet of paper
- small piece of wool
- penny

Activity Procedure

1. Hold your bare hands together, palms touching. Do your hands feel cold or hot? **Record** what you **observe**.
2. Make a **hypothesis**. What would you feel if you rubbed your hands together? **Record** your hypothesis.

◄ Standing close to a grill, you can feel the heat. It begins in the coals. Then the sides of the grill get hot. When the fire is ready for cooking, almost any part of the grill feels hot.

3. Now rub your palms together very fast for about ten seconds. **Record** what you **observe**. (Picture A)
4. What might you feel if you rubbed the button with wool? The penny with the paper? Form a **hypothesis** for each test. **Record** each one.
5. Rub the button with the wool for about ten seconds. Touch the button. Touch the wool. **Record** what you **observe**. (Picture B)
6. Then rub the penny with the paper for about ten seconds. Touch the penny. Touch the paper. **Record** what you **observe**.

Picture A

Picture B

Draw Conclusions

1. What changes did you **observe**? What actions did you perform that caused the changes you observed?
2. Were your **hypotheses** correct? If not, how could you change them based on what you learned?
3. **Scientists at Work** Scientists use their knowledge and experiences to help them **hypothesize**. What knowledge and experiences did you use in this investigation to help you hypothesize?

Process Skill Tip

A **hypothesis** is tested by **controlling variables** while conducting an **experiment** . This is called a controlled test.

LEARN ABOUT

Heat

FIND OUT

- what heat is
- how heat is produced and used
- what temperature is, and how it is measured

VOCABULARY

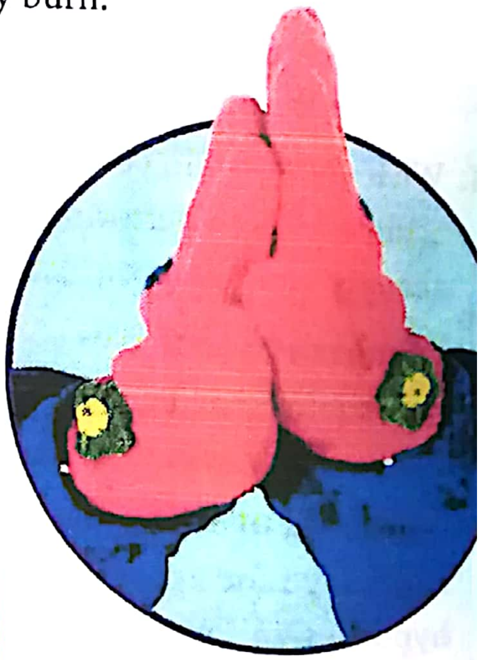
heat
temperature
thermometer

Heat and How It Is Produced

Heat is something that makes things hotter. On sunny days, you feel the heat that comes from the sun. Heat from the sun warms soil, water, air, and living things.

You saw in the previous activity that rubbing two bodies together produces heat, so that objects become hotter. People can also produce heat by burning fuel. Oil , natural gas, and wood are some materials used as fuel. Ï produce heat as they burn.

✓ **What is heat?**



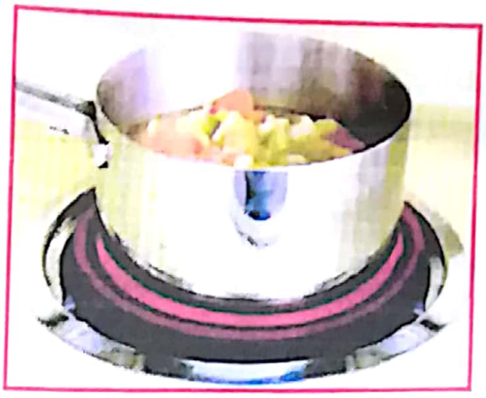
When you rub your hands together, you feel warm. ►

◄ Heat from the sun warms Earth's surface and its inhabitants.

People burn oil and gas to heat their homes, schools and other buildings. Gas is used also for cooking.

Wood burns very easily. That is why fires can start in forests if people are not careful. Some people also burn wood in fireplaces to heat their homes and cook their food. Heat produced from electricity is also used to heat homes, cook food, and heat water.

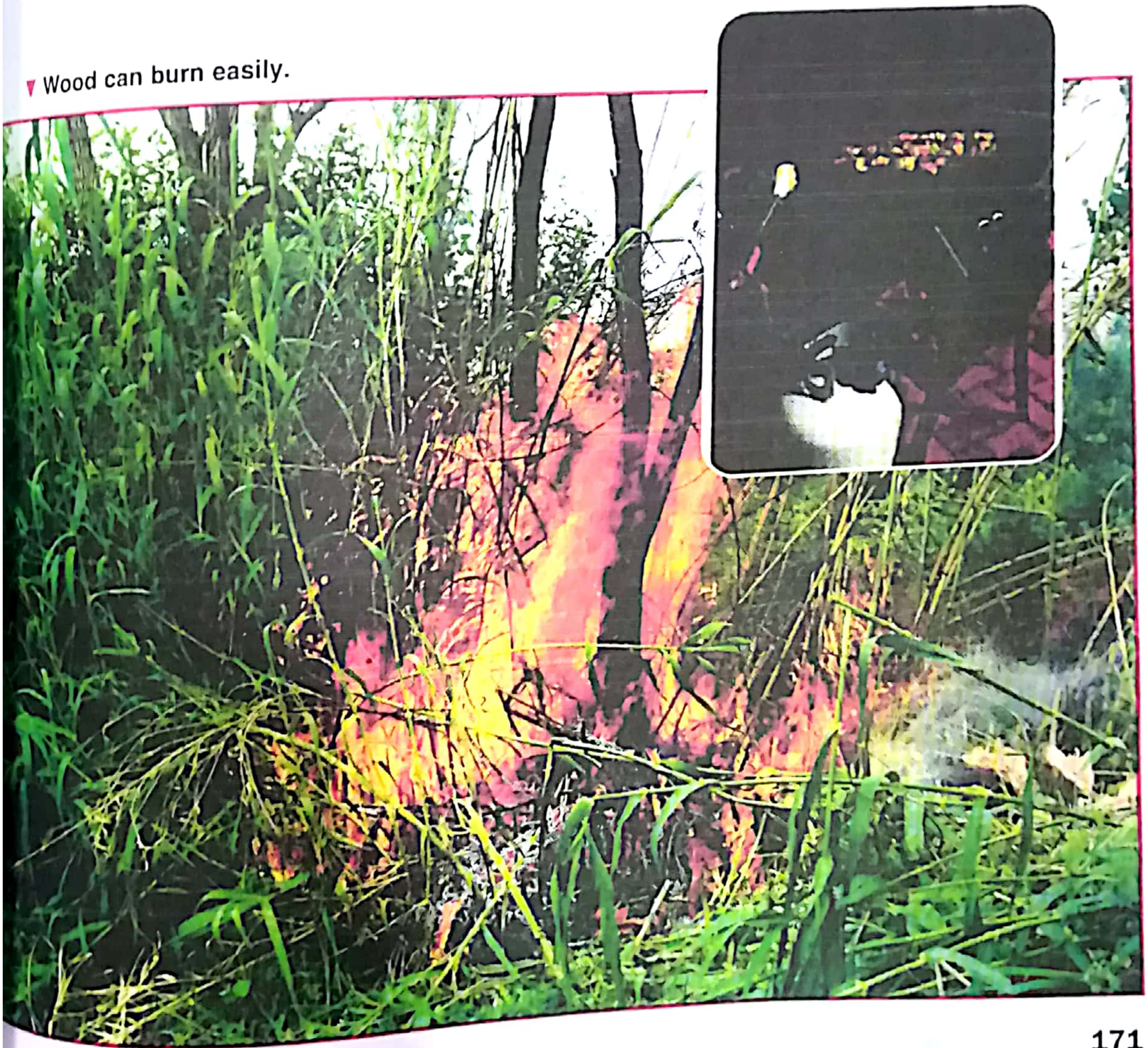
✓ How do people produce heat?



▲ Heat produced from electricity is used for cooking.

▼ Natural gas is used for cooking.

▼ Wood can burn easily.



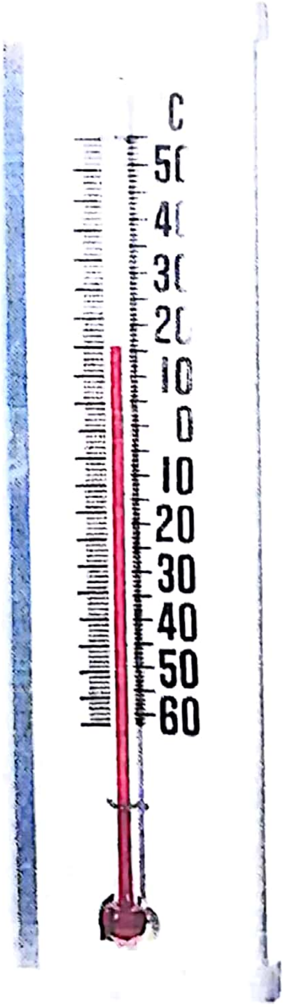
Temperature

Temperature is a measure of how hot or cold something is. A **thermometer** is a tool to measure the body temperature. Thermometers have numbers printed on them much like rulers do. Temperature is measured in Celsius (°C).

You can measure the temperature of air, food, or your body.

Hot objects are at high temperatures, while cold objects are at low temperatures. The temperature of a natural gas flame is 660°C, and of boiling water is 100°C. The temperature of freezing water is 0°C

✓ **How do people use thermometers?**



Most thermometers contain liquid in a tube. You can see numbers on this thermometer. These numbers are according to the Celsius scale. ►

◄ Digital thermometer.

Summary

Heat is something that makes things warm. People produce heat by burning kinds of fuel. Heat is used to cook food and heat houses and water. Temperature is a measure of how hot or cold something is. A thermometer is used to measure temperature.

Review

1. What does heat do to matter?
2. Name two ways heat can be used.
3. Name two ways heat can be produced.
4. Why is it important to know what the temperature outside is?
5. **Test Prep** What do you use to measure the temperature ?

A rubbing
B thermometer
C balance
D wires

LINKS

MATH LINK

Find The Temperature Difference

A pie has to bake at 200°C for 15 minutes. Then it has to bake at 180°C for 45 minutes more. What is the difference between the two temperatures?

HEALTH LINK

Heating

Man has used wool and animal hair to feel warm. Learn about four kinds of animals that give us wool and hair.

Spoons		
Wooden	Plastic	Metal

Cups		
Ceramic	Plastic	Metal

Picture A

Picture B

③ Gently touch each spoon. Which one is hottest? **Record** how hot each spoon is. Use words like *cool, warm,* or *hot.* (Picture A)

④ Next, fill each cup with hot tap water. Wait one minute. Then gently touch the handle of each cup. Which one is hottest? (Picture B)

⑤ Use the words you wrote in Step 4 to record how hot each cup handle is.

Draw Conclusions

1. Study your spoons chart. Did all the spoons get hot? Which spoon got the hottest?
2. Look at both charts. Which material got hot in both experiments? How did the plastic items change in the hot water?
3. **Scientists at Work** As they test their ideas, scientists may change their experiments in small ways. Suppose you want to see if wood always stays cool when it is placed near heat. What kinds of wooden objects could you use in your experiment?

Process Skill Tip

Scientists wonder how things work. They **form hypotheses** to explain how things work. To test their hypotheses, they do experiments. An **experiment** is a kind of test done very carefully to find out new information.

LEARN ABOUT

How Heat Moves

FIND OUT

- one way heat moves
- how to keep heat from moving easily

VOCABULARY

conduction
conductor
insulator

Conduction

In the investigation you put a metal spoon into hot water. It got hot. Heat moves from the hotter objects to the cooller objects.

To fry an egg, you put it in a pan. Then you put the pan on the stove. Heat from the stove makes the pan hot. Heat is transferred at once from the pan into the egg. The transfer of heat between objects that touch each other is called **conduction**.

✓ **How does heat move between objects that touch each other?**

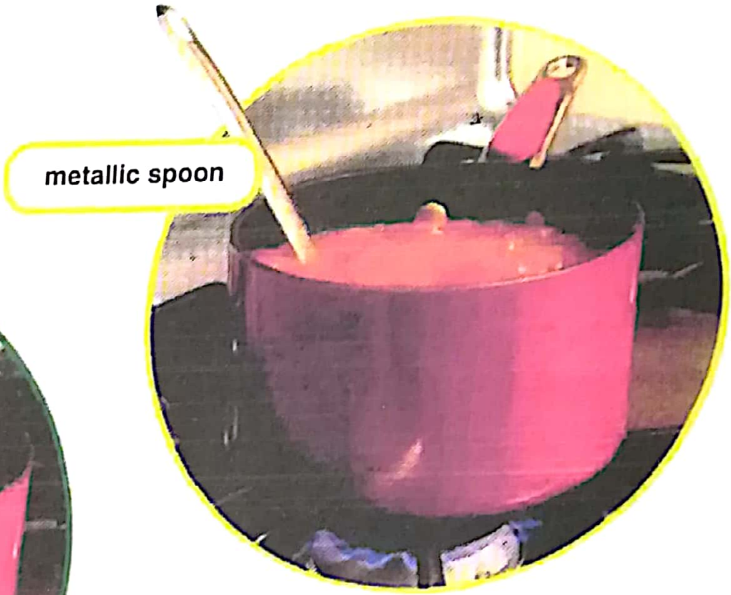
▼ Heat is transferred from hot objects, like a stove, to cold objects like eggs.

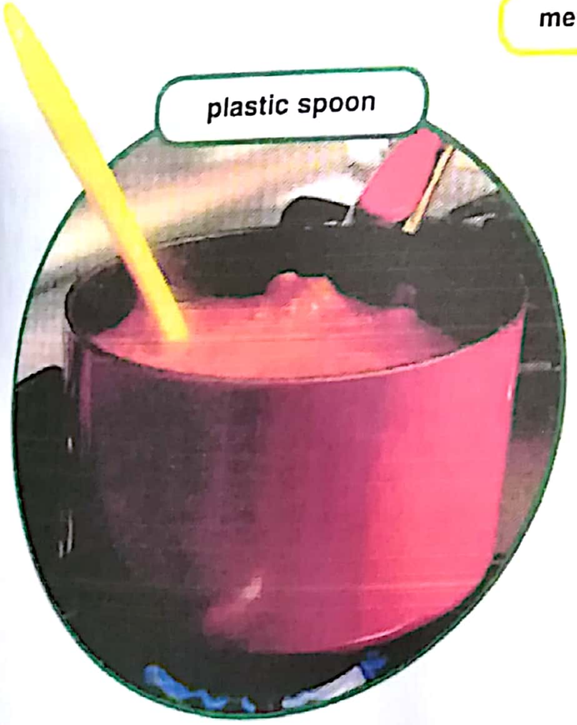
Conductors

When your mother heats cold soup, heat is tranferred from the stove into the pot, and then from the pot into the soup. When more and more heat is tranferred, the soup gets hotter.

A **conductor** is a material through which heat moves quickly and easily. That is why most pots and pans are made from metals such as copper, aluminum, or iron. A metallic spoon placed in soup becomes hot very quickly. However, heat does not move easily through plastics and wood.

✓ **Give two examples of good conductors of heat?**





Insulators

Heat from stoves or ovens can make pots, pans, and trays very hot. People can burn thier hands if they touch the metal. To protect their hands, people wear oven gloves. Oven gloves are made from a thick material heat can not move through it easily. Oven gloves are insulators. An **insulator** is a bad conductor of heat. Fabrics, plastic, and wood are insulators.

Air is also an insulator. The material of some clothes that we wear during winter contains air bubbles. Air prevents the transfer of heat from your body to the outside, so you feel warm.

✓ **Give two examples of bad conductors of heat?**

◄ The insulating oven gloves help protect your hands.

Summary

When things touch each other, heat moves between them by conduction. Conductors let heat move easily. Insulators are materials in which heat cannot move easily. Metals are good conductors of heat. Wood, plastic, fabrics, and air are heat insulators.

Review

1. How does heat move between objects that touch each other?
2. Is an oven glove a conductor or an insulator? Explain.
3. Are cooking pots made of metal conductors or insulators? Explain.
4. Some animals feel warm because they are covered with wool. Why do you feel warm when you put on a sweater or coat made of wool?
5. **Test Prep** Which of the following is a good conductor of heat?

A air.
B fabrics.
C copper.
D wood.

LINKS

MATH LINK

Find Elapsed Time

Suppose the burner under a pot of water is turned on at 2:15 P.M. It begins to boil at 2:35 P.M. How long did it take the water to come to a boil?

HEALTH LINK

Safety Rules

People need heat, but using heat could be dangerous. Write down two safety rules to use in the kitchen while cooking food on a stove.

CHAPTER 2 Review and Test Preparation

Vocabulary Review

Choose a term below to match each definition. The page numbers in ( ) tell you where to look in the chapter if you need help.

heat (170)
temperature (172)
thermometer (172)
conduction (176)
conductor (177)
insulator (178)

1. ___ The movement of heat in two solids that are touching.

2. ___ Matter in which heat cannot move easily.

3. ___ something that makes things hot.

4. ___ Matter in which heat moves easily.

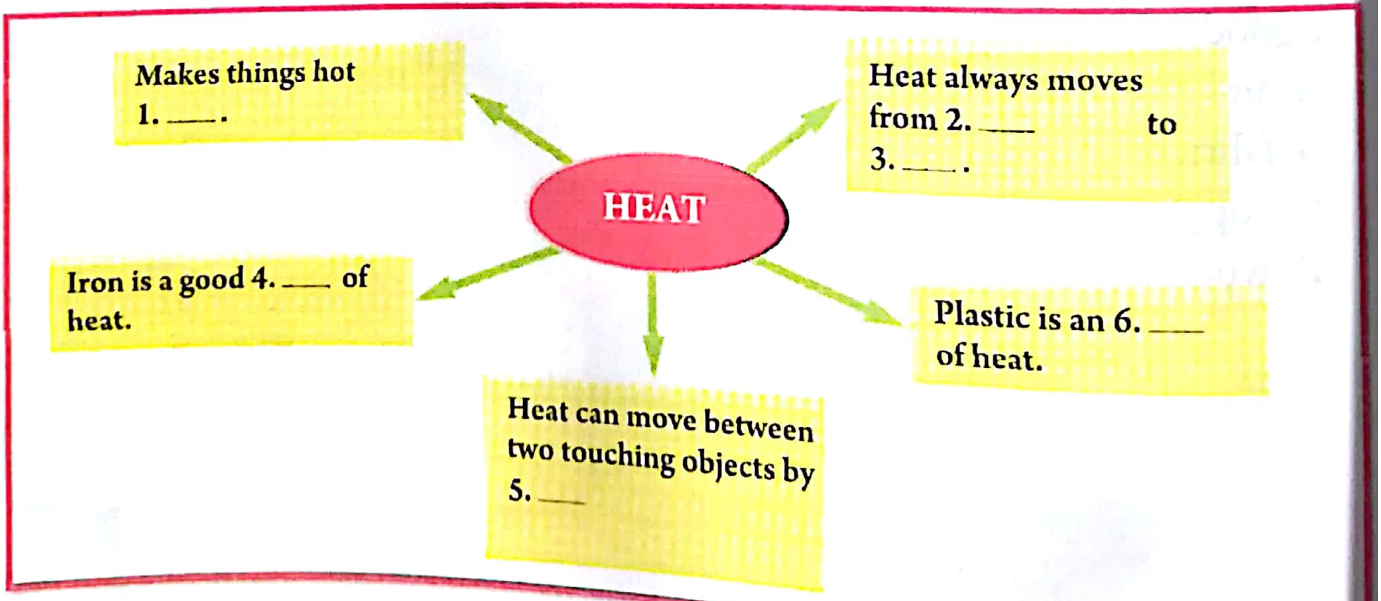
5. ___ A tool that measures temperature.

6. ___ A measure of how cold or hot something is.

Connect Concepts

Use the terms to complete the concept map.

hot **conductor** **conduction** **heat** **insulator** **cold**



Makes things hot 1. ___.

Heat always moves from 2. ___ to 3. ___.

Iron is a good 4. ___ of heat.

Plastic is an 6. ___ of heat.

Heat can move between two touching objects by 5. ___

Check Understanding

Circle the letter of the best choice.

1. Which of the following is an insulator?
   - A silver spoon
   - B aluminum foil
   - C stainless steel spoon
   - D wooden spoon
2. Which of the following is a conductor?
   - A wooden spoon
   - B oven gloves
   - C aluminum foil
   - D woollen sweater
3. Ahmad puts his hands on an ice cube.
   - A Heat moves from the ice to Ahmad's hands.
   - B Heat moves from Ahmad's hands to the ice.
   - C Heat does not move between Ahmad's hands and the ice.
   - D Heat moves from the ice to Ahmad's hands and back.
4. The handle of a pan is often made of wood since wood is:
   - A a good conductor of heat
   - B tough, strong, and does not break
   - C not attracted by magnets
   - D a bad conductor of heat

Answer the following question:

5. When you take a pan out of a hot oven, you place a straw placemat on the table to put the pan on. Why?

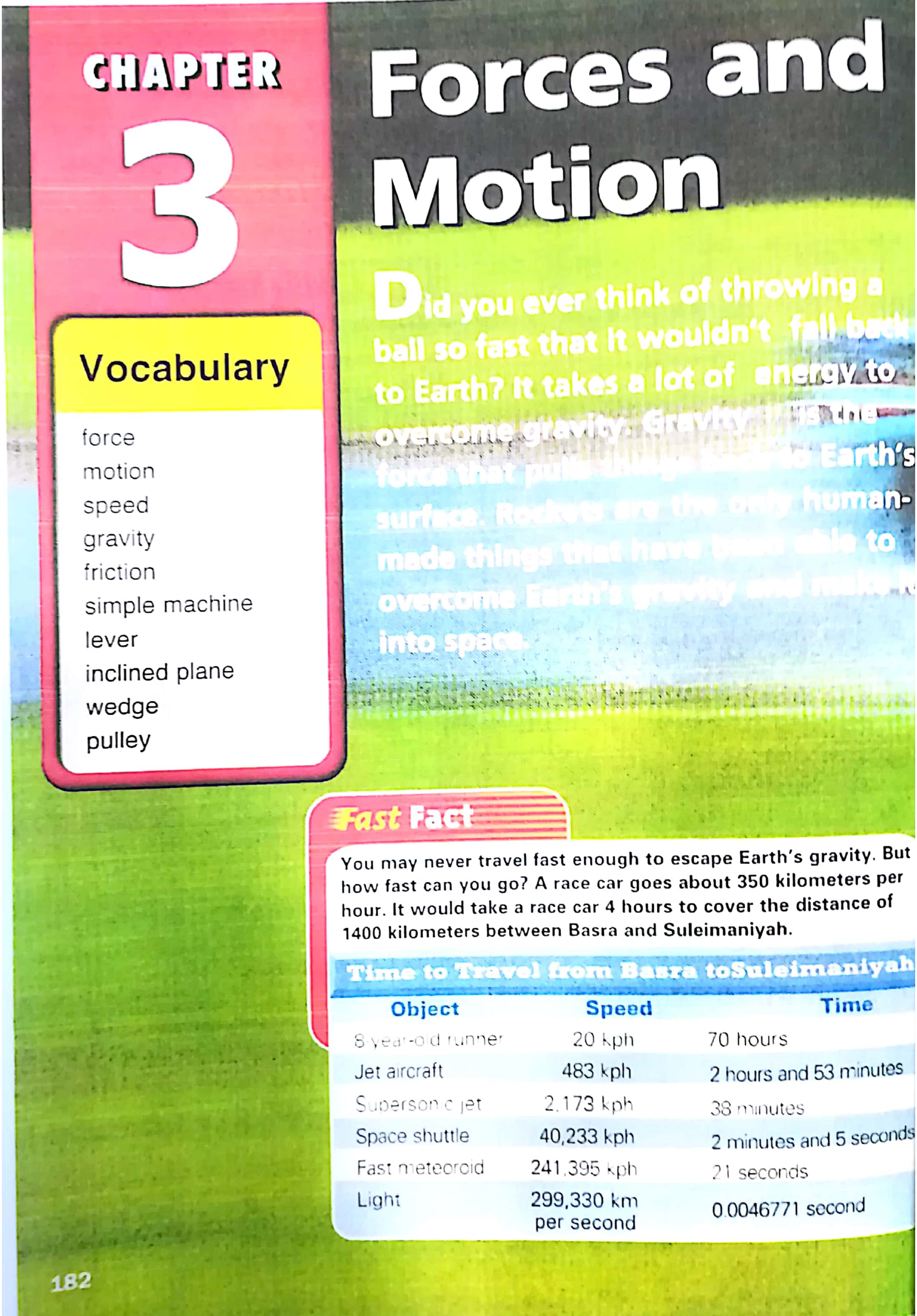
Process Skills Review

It is June. What **hypothesis** can you make about the temperature at a depth of 30 cm in the ground in Kurdistan region? How can you test your **hypothesis**?

Performance Assessment

Make a diagram of a thermometer

Water boils at 100°C and freezes at 0°C. Make a drawing of a liquid thermometer in a pot of boiling water. Make a drawing of another liquid thermometer in a pot of freezing water. Explain what happens to the thermometer when it is transferred from the boiling water to the freezing water.



CHAPTER 3

Forces and Motion

Vocabulary

- force
- motion
- speed
- gravity
- friction
- simple machine
- lever
- inclined plane
- wedge
- pulley

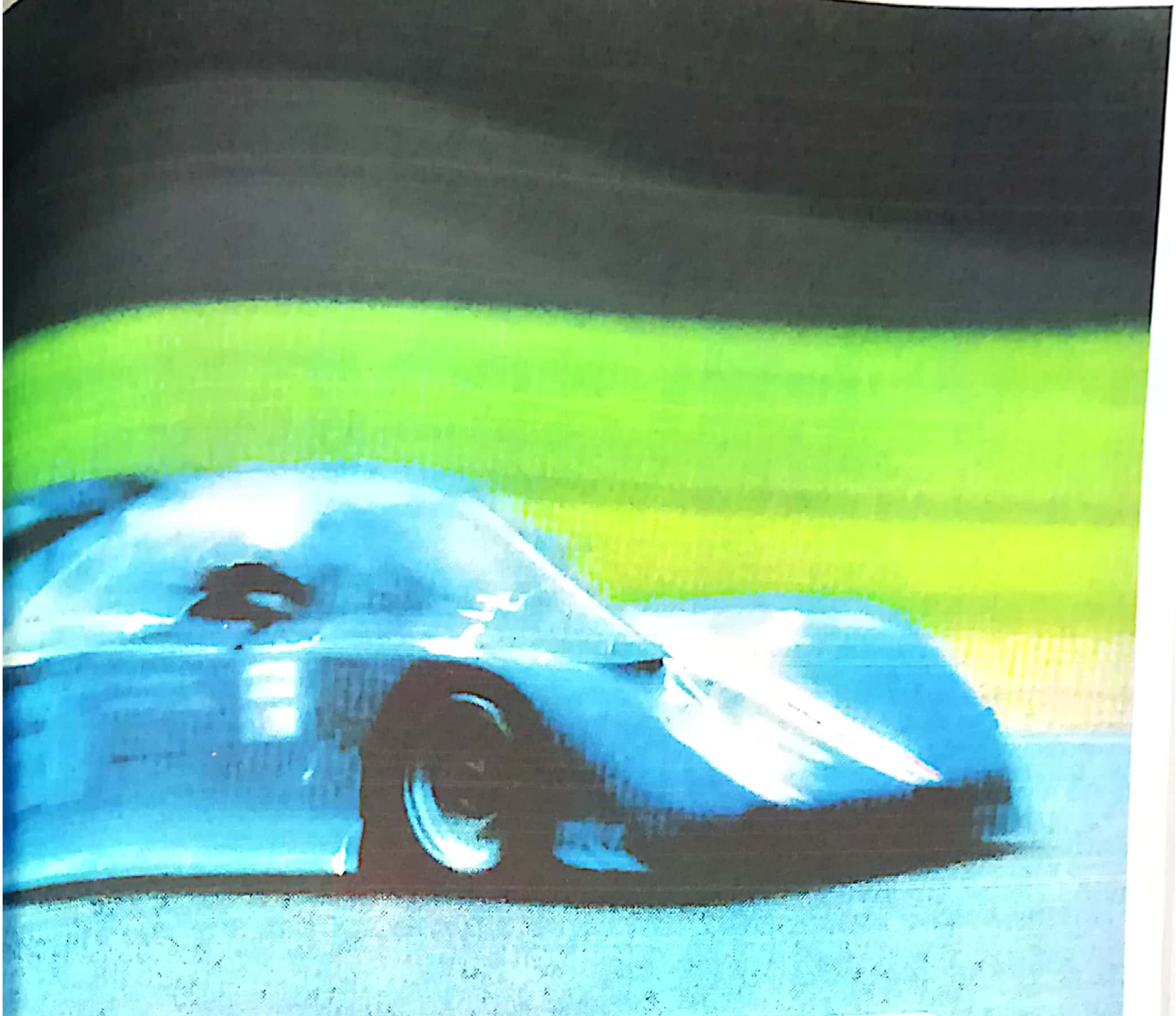
Did you ever think of throwing a ball so fast that it wouldn't fall back to Earth? It takes a lot of energy to overcome gravity. Gravity is the force that pulls things back to Earth's surface. Rockets are the only human-made things that have been able to overcome Earth's gravity and make it into space.

Fast Fact

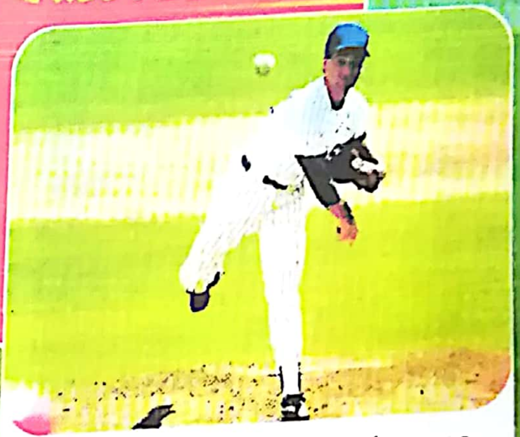
You may never travel fast enough to escape Earth's gravity. But how fast can you go? A race car goes about 350 kilometers per hour. It would take a race car 4 hours to cover the distance of 1400 kilometers between Basra and Suleimaniyah.

Time to Travel from Basra toSuleimaniyah

Object	Speed	Time
8-year-old runner	20 kph	70 hours
Jet aircraft	483 kph	2 hours and 53 minutes
Supersonic jet	2,173 kph	38 minutes
Space shuttle	40,233 kph	2 minutes and 5 seconds
Fast meteoroid	241,395 kph	21 seconds
Light	299,330 km per second	0.0046771 second



Fast Fact



To throw a ball that doesn't come back down, you'd have to throw it at a speed of at least 40,000 kilometers per hour! A good fastball pitcher can throw a baseball at a speed of about 160 kilometers per hour.

LESSON 1

How Do Forces Cause Motion?

In this lesson, you can . . .

INVESTIGATE how forces affect speed.

LEARN ABOUT how forces affect motion.

LINK SCIENCE to math and social studies.

INVESTIGATE

Speed Ramp

Activity Purpose Riding a bike downhill is easier than riding it uphill. Going downhill is also much faster. In this investigation, you'll **infer** how ramp inclination affects speed.

Materials

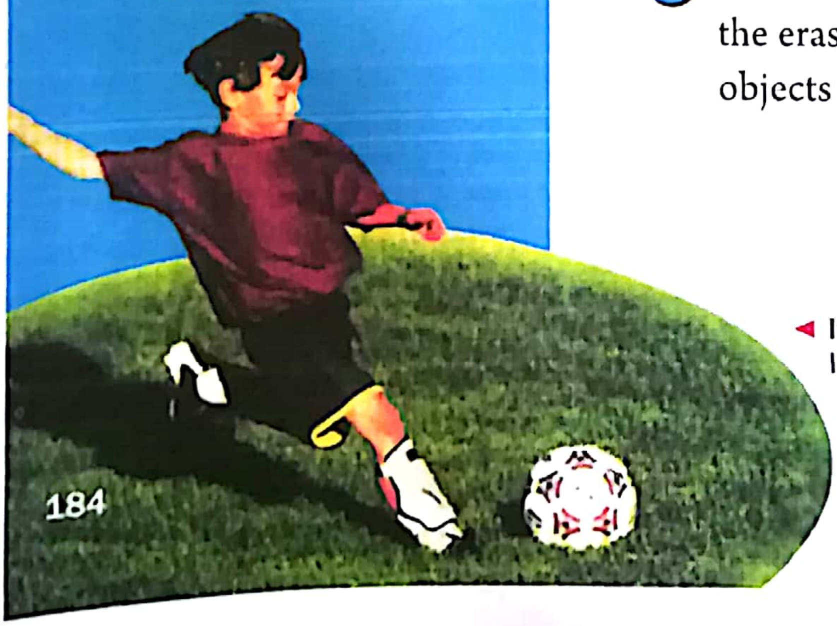
- books
- wooden block
- metric ruler
- a penny
- eraser
- oven tray

Activity Procedure

① Stack the books to about 5cm high. **Record** the height in the chart. (Picture A)

② Prop one end of the oven tray on the stack of books to make a ramp.

③ Place the penny, the wooden block, and the eraser at the top of the tray. Let the objects go at the same time.



◄ **If the boy kicks the ball with a larger force,it goes faster.**

4. **Record** how fast each item travelled. Use words such as fastest, slowest, and did not move.

5. Add books to make the stack about 10cm high. Repeat steps 2-4.

6. Add more books to make the stack about 15cm high. Repeat steps 2-4.

Picture A

“Speed Ramp” Data Table

Object	Height of Books (cm)	Speed
Penny		
Block		
Eraser		

Picture B

Draw Conclusions

1. Compare the speeds of the sliding objects with the increasing height of the stack. **Record** your **observations.**
2. **Infer** why the speeds of the objects changed.
3. **Scientists at Work** **Predict** how your results would change if you coated the oven tray with a thin layer of oil.

Process Skill Tip

Infer means to **interpret data** based on things you already know.

LEARN ABOUT

Forces and Motion

FIND OUT

- how forces affect motion
- what motion is
- what speed is
- what gravity is
- what friction is

VOCABULARY

force
motion
speed
gravity
friction

Forces

To move a ball, you can throw it, kick it, or hit it. A **force** is a push or a pull. You can push a door, or pull a cart. Any kind of push or pull is a force. You should apply a force on an object to move it. An object keeps moving untill another force stops it.

✓ **What is a force?**

To open a drawer, you have to pull it. ►

▲ The man pushes the pram to move it. Force is a push.

The goalkeeper uses his hands to apply a force on the ball to stop it.

Motion

Birds are flying across the sky. Insects are crawling across the ground. Balls are rolling on the playground. Leaves move back and forth in the breeze. The wheels of a bicycle are rotating in a circle. All these things are in motion. **Motion** is a change in position.

Everything has a position. You know your position in the classroom. In order to reach the blackboard, you need to move to change your position. You know the position of your classroom in the school. Your classroom does not change position. It does not move.

✓ **What is motion?**

Football players are in continuous motion. Their positions are changing continuously.

Speed

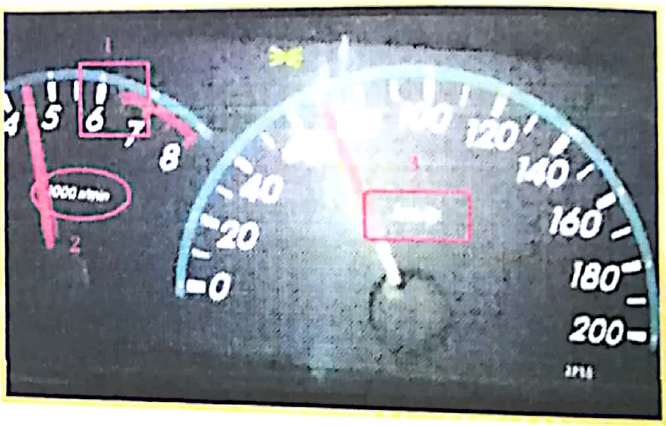
The distance covered by an object in a given time is called **speed**. Speed is measured in kilometers per hour (km/h) (1km = 1000 meters). An object that moves a greater distance in the same amount of time has greater speed.

If you move with a classmate from a given point in the school yard towards the main gate, he who reaches the gate first has a greater speed.

Objects that cover different distances in the same amount of time have different speeds. Cars are faster than bicycles, and bicycles are faster than a child walking.

Larger forces cause objects to move with greater speeds.

✓ What is speed?



The speedometer shows that the car is going faster than 70 km/h. ▶

▼ The speed of an object is the distance it covers in a given time. Some objects move faster than others.

The speed of a snail is 0.05 km/h

The speed of a person walking is 5 km/h

The speed of a person cycling is 60 km/h

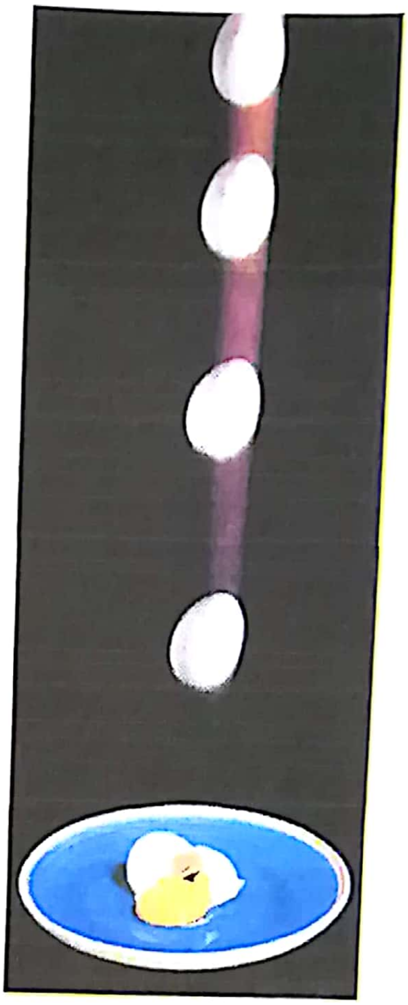
The speed of a race horse is 70 km/h

Types of Forces

Gravity

Gravity is the force that pulls things towards ground. Any thing you release will fall down unless something stops it. Gravity is the force that makes things fall towards the surface of Earth. Gravity is the force that made objects slide down a ramp in the previous activity. Gravity also keeps people and things on the ground.

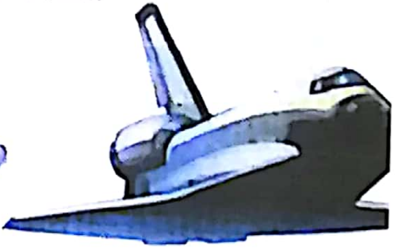
✓ **What is gravity?**



▲ Gravity is the force that pulls objects towards Earth. On Earth, all things fall towards the ground.

▲ Gravity is the force that pulls the apple towards the ground. When the stalk breaks off the apple falls down.

The speed of a spacecraft is 30,000 km/h



The speed of a race car is 380 km/h

The speed of a jet plane is 1,000 km/h

Friction

Friction is a force that slows down moving objects or stops them from moving. The force of friction takes place when two objects rub together. If you roll a ball on a pitch, it keeps going, but it'll finally stop due to friction between the ball and the ground. The force of friction between smooth surfaces is weaker than the force of friction between rough surfaces. Objects slide easier on smooth surfaces than on rough surfaces.

✓ **What is friction?**

▼ **When the brakes of the bicycle are pressed, a piece of rubber rubs against the wheels and causes friction. The wheels turn more and more slowly unless the force of friction is enough to stop the wheels from moving.**

Summary

A force is a push or a pull. Motion is a change in position. All motion is caused by forces. Speed is the distance covered by an object in a given time. Gravity is the force that pulls objects towards Earth. Friction is the force that slows moving objects down and stops them.

Review

1. What is force?
2. What force pulls things toward Earth?
3. What is speed?
4. What happens to a rock on a ramp if no force affects it?
5. **Test Prep** What changes when an object moves?
   A Its shape.
   B Its mass.
   C Its position
   D Its volume.

LINKS

MATH LINK

Subtract

A cheetah can run as fast as 110 kilometers per hour. A zebra can run a distance of 60 kilometers per hour. How much faster can a cheetah run?

SOCIAL STUDIES LINK

Newton

Use the books and references in your school's library, or ask adults in your family about the life of scientist Isaac Newton. Share the information with your friends.

LESSON 2

What Are Simple Machines?

In this lesson, you can . . .

INVESTIGATE the role of a lever.

LEARN ABOUT kinds of simple machines.

LINK SCIENCE to math and writing.

INVESTIGATE

Using a Lever

Activity Purpose You use machines to help you move or lift objects. One of these machines is the lever. In this investigation you will **make a model** of a lever to understand how it works.

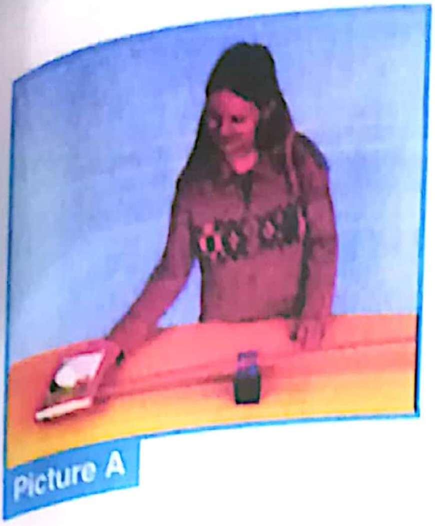
Materials

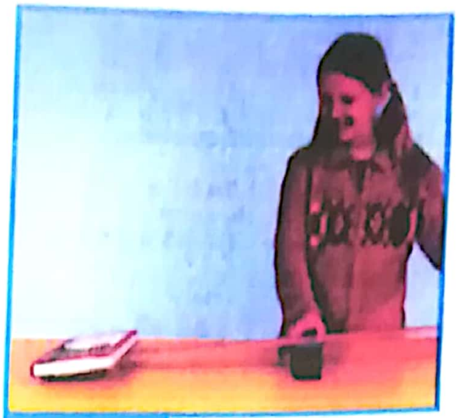
- blackboard eraser (2)
- firm meterstick
- small book

Activity Procedure

1. Put one eraser above the other.
2. Put the meterstick over the erasers such that it is not balanced.

◄ This person uses a screw driver as a lever to open a paint can.


Picture A


Picture B

③ Put the book on the edge of the stick that is closer to the erasers. (Picture A)

④ Press the other edge of the stick down with your hand. **Observe** what happens to the book. (Picture B)

⑤ Lift the book with your hand, and estimate the force you used.

Draw Conclusions

1. Compare the force you used to lift the book in step 4 and the force you used in step 5.
2. How did the use of the stick and the erasers make it easier to lift the book?
3. The stick and the erasers are a model of a simple machine called lever. What is the role of a lever in moving objects
4. **Scientists at Work** Suppose you put the book on the edge of the stick that is further away from the erasers. **Predict** whether lifting the book, using the stick and erasers is easier or more difficult compared to the first experiment. Test your prediction.

Process Skill Tip

When you make a model of something, you use it to know how this thing works.

LEARN ABOUT

Simple Machines

FIND OUT

- what a simple machine is
- names of simple machines

VOCABULARY

simple machine
lever
inclined plane
wedge
pulley

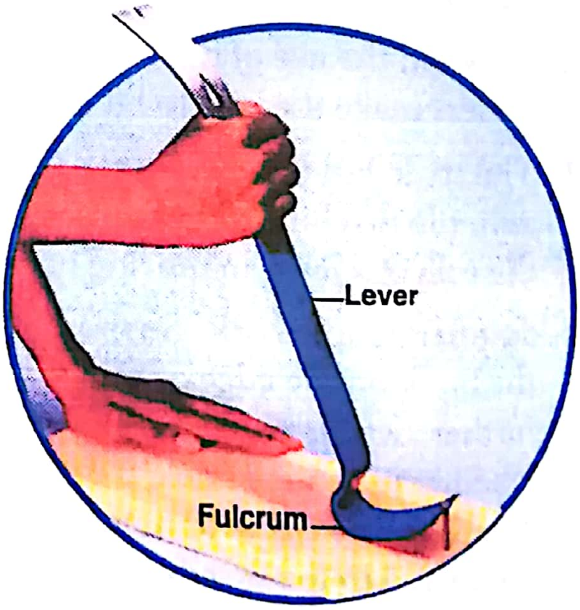
Lever

A **simple machine** is a tool that helps people move things more easily. The lever is one such tool. A **lever** is a bar that moves on or around a fixed point called *fulcrum*.

You cannot, for example, pull out a nail from a piece of wood with your hand, because this needs a lot of force. But you can do it easily with a lever if you push one end under the nail and press the other end downwards. The nail will move upwards and you will be able to pull it out easily using less force. The lever reduces the amount of force you have to use to move objects. The trolley, spade and pickaxe are examples of a lever.

✓ **What is a simple machine?**

◄ The trolley is a lever. You can lift and move the boxes more easily when you use a trolley.



▲ This is a wrench. When you push the handle downwards, the nail moves upwards.

Inclined Plane

You can also move things more easily using an inclined plane. An **inclined plane** is a slanting surface that joins a low level with a higher level. When you climb a staircase or a ladder, or go down a slope, you use an inclined plane.

When you use an inclined plane, you use less force to move objects. But you have to move objects a longer distance.

✓ **What is an inclined plane?**

▲ The boy uses an inclined plane to push a trolley a longer distance but with a lesser force.

Wedge

The **wedge** is another simple machine with one thick end and another thin pointed end. It is a system of two inclined planes joined together back to back. This tool is used to keep two things apart, to cut or divide objects or to split an object into two parts. The knife is an example of a wedge.

▲ The knife is a wedge.

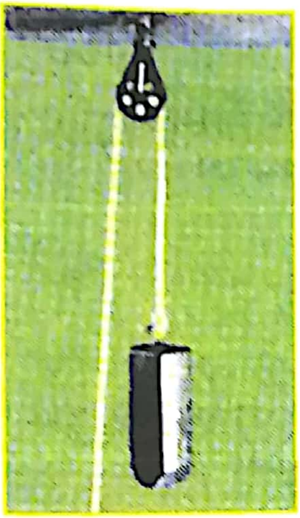
▲ The axe is a wedge that cuts wood.

the chisel is a wedge that cuts stone. ▶

Pulley

The **pulley** is a simple machine consisting of a wheel over which a rope or chain is pulled in order to raise or lower heavy objects. As you pull down on one end of the rope or chain, the wheel rotates and the other end of the rope goes up lifting whatever is attached to it. The pulley changes the direction of the force you use but does not reduce the amount of this force. Due to gravity, pulling down is easier than pulling up. The pulley makes it easier to lift objects

✓ **How does the pulley work?**



▲ The pulley does not change the amount of force needed to move an object.

▼ The pulley at the top of the flag is used to move the flag up and down. A pulley is a wheel with a rope that goes over it.

Summary

A simple machine makes it easier to move objects. It reduces the amount of force needed to move objects, or changes its direction. The lever, inclined plane, pulley, and wedge are examples of simple machines.

Review

1. Describe a lever.
2. How are the inclined plane and wedge similar?
3. What does a pulley do?
4. Name two ways simple machines make it easier move objects.
5. **Test Prep** Which simple machine is a wedge?
   - **A** pulley
   - **B** lever
   - **C** axe
   - **D** wrench

LINKS

MATH LINK

Solve a Problem

Aveeben used a pulley to lift an object whose mass is 10kg from a well. She attached an object whose mass is 7kg to the other end of the rope. Can she lift the object from the well? Why?

WRITING LINK

Explanation

In your daily life, you use objects that are actually levers like tweezers and pincers. Explain the use of one of these tools.

CHAPTER 3 Review and Test Preparation

Vocabulary Review

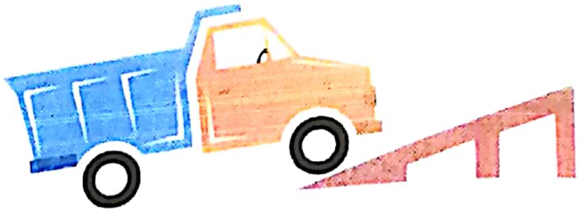
Choose a term below to match each definition. The page numbers in ( ) tell you where to look in the chapter if you need help.

force (186)
motion (187)
speed (188)
gravity (189)
friction (190)
simple machine (194)
lever (194)
inclined plane (195)
wedge (195)
pulley (196)

1. ____ The distance an object moves during a given time
2. ____ A flat surface set at an angle to another surface
3. ____ A change in position
4. ____ A force that pulls all objects towards Earth.
5. ____ A tool that helps people move objects easily.
6. ____ A bar that moves on or around a fixed point.
7. ____ A push or a pull
8. ____ Two inclined planes stuck back to back.

Connect Concepts

Study the diagram. Then use terms from the chapter to complete the sentences.



1. Your push on the truck is a ____.
2. The length of the ramp is the ____ the truck must move.
3. The simple machine the truck is moving up is an ____.

Check Understanding

Write the letter of the best choice.

1. A rock sat on the edge of a cliff. One day the rock fell off. The force that caused this motion was probably ____
   A inclined plane
   B pulley
   C friction
   D gravity

2. Workers at airports use a moving ramp to get the suitcases on the airplane. What kind of simple machine is it? ____
   - **A** inclined plane
   - **B** wedge
   - **C** lever
   - **D** pulley

3. A jet flies at 550 km/h. This is a measure of ____
   - **A** height
   - **B** speed
   - **C** fuel
   - **D** weight

4. What simple machine does Sheelan use to lift a paint can to the second floor while staying on the ground floor? ____
   - **A** pulley
   - **B** inclined plane
   - **C** wedge
   - **D** screw

5. ____ slows moving objects down or stops them.
   - **A** gravity
   - **B** speed
   - **C** friction
   - **D** pulley

Answer the following question.

6. Why do we need the force of gravity when we play on the swing?

Process Skills Review

1. A red car and a blue car travel together everyday to Dohouk which is 100 km away. The red car gets there first. What can you **infer** about the speed of the two cars?
2. The teacher asked the students to use things in the classroom to make a simple machine. You see a ruler and a rubber eraser. **Predict** the two simple machines the students might make?

Performance Assessment

Simple Machines

Work with a partner to design and construct a device that can be used to move a textbook from one side of a desk to the other. Be sure your device contains at least one simple machine.

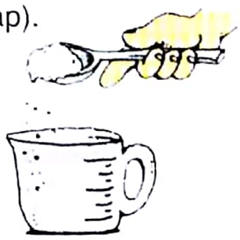
ACTIVITIES FOR HOME OR SCHOOL

MAKING A SOLUTION

Which works better, hot or cold water?

Materials

- 2 small, heatproof glass containers
- cold water
- spoon
- clock with a second hand
- sugar
- warm water (from the tap).



Procedure

① Fill one container with cold water.

② Mix in a spoonful of sugar. Stir until the sugar dissolves.

③ Watch the clock as you stir to see how long it takes the sugar to dissolve. Record the number of seconds it takes.

④ Repeat steps 1-3 using warm water. Record the number of seconds it takes the sugar to dissolve.

Draw Conclusions

How were the results different? Why do you think they were different?

COOLING WATER

How long does it take warm water to cool?

Materials

- 2 foam cups
- measuring cup
- 2 thermometers
- clock with a second hand
- hot water

Procedure

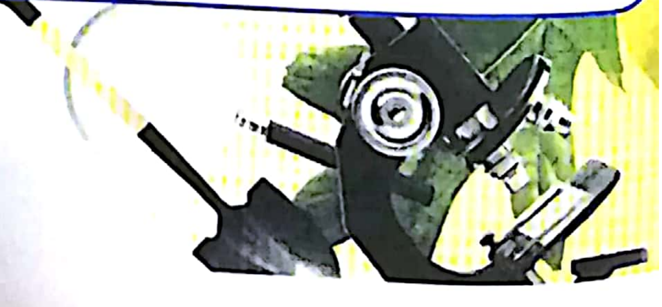
① Fill one cup with warm water. Fill half the other cup with warm water.

② In which cup will the water cool faster? Make a hypothesis to answer the question. Write down your hypothesis.

③ Make a chart to record temperatures. Record the starting temperature in each cup. Then record the temperature of each cup every minute until one of the cups reaches room temperature (25°C).

Draw Conclusions

Was your hypothesis correct? Explain.



Health Handbook

Safety and First Aid

First Aid for Chocking and Bleeding 202
First Aid for Nosebleeds and Insect Bites 204

Nutrition and Food Safety

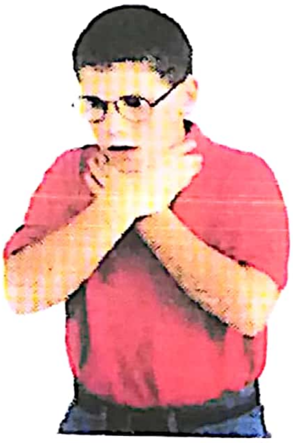
Fight Bacteria 206
Food Safety Tips 207

First Aid

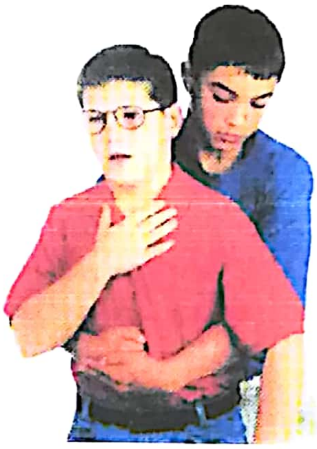
For Chocking

The tips on the next few pages can help you provide simple first aid to others and yourself. Always tell an adult about any injuries that occur.

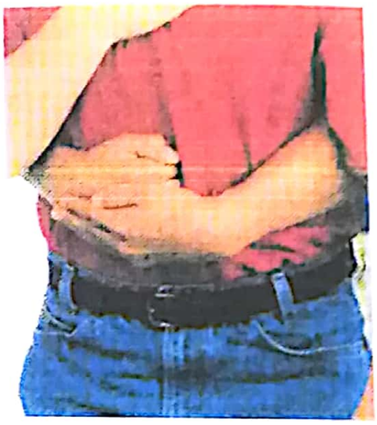
If someone else is chocking...



1. Recognize the Universal Chocking Sign–grasping the throat with both hands. This sign means a person is chocking and needs help.

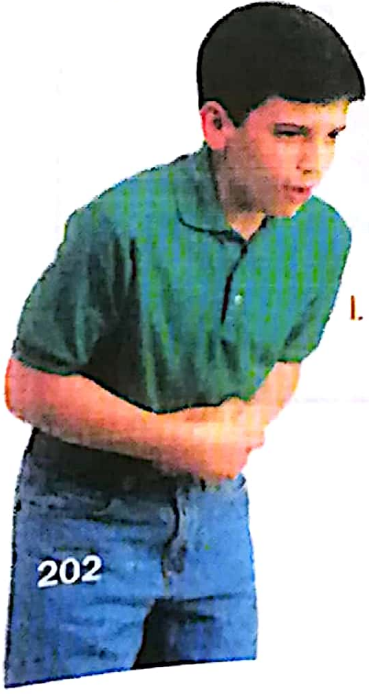


2. Put your arms around his or her waist. Make a fist and put it above the person's navel. Grab your fist with your other hand.

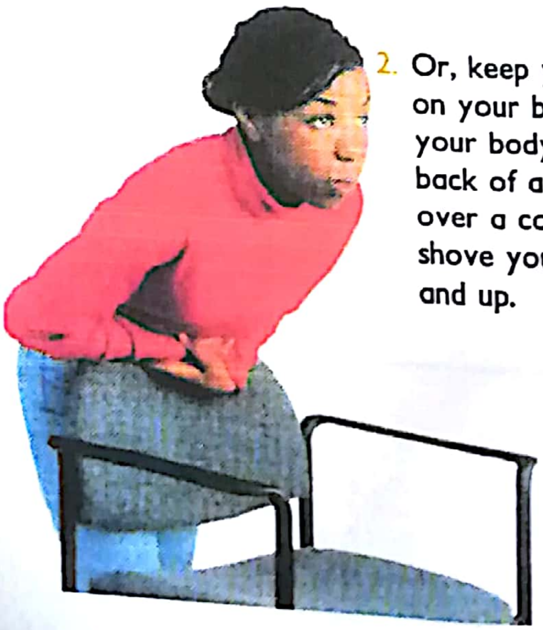


3. Pull your hands toward yourself and give five quick, hard, upward thrusts on the chocker's belly.

If you are chocking when alone ...



1. Make a fist and place it above your navel. Grab your fist with your other hand. Pull your hands up with a quick, hard thrust.

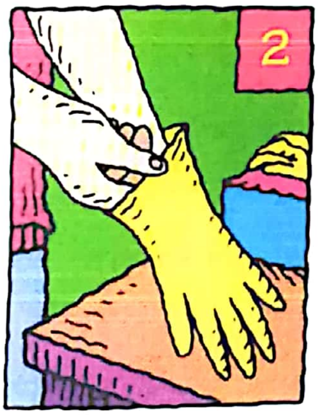


2. Or, keep your hands on your belly, lean your body over the back of a chair or over a counter, and shove your fist in and up.

For Bleeding...

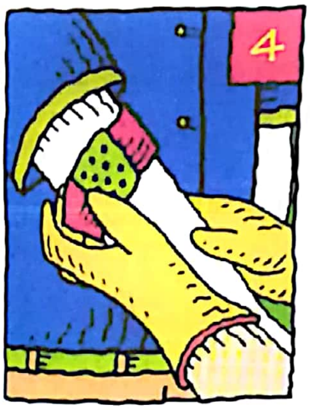
If someone else is bleeding...

Wash your hands with soap, if possible.



Put on protective gloves, if available.

Wash small wounds with soap and water. Do not wash serious wounds.



Place a clean gauze pad or cloth over the wound. Press firmly for ten minutes. Don't lift the gauze during this time.

If you don't have gloves, have the injured person hold the cloth in place with his or her own hand.

If after ten minutes the bleeding has stopped, bandage the wound. If the bleeding has not stopped, continue pressing on the wound and get help.

If you are bleeding ...

- Follow the steps shown above. You don't need gloves to touch your own blood.
- Be sure to tell an adult about your injury.

First Aid

For Nosebleeds...

- Sit down and tilt your head forward. Pinch your nostrils together for at least ten minutes.
- You can also put an ice pack on the bridge of your nose.
- If your nose continues to bleed, get help from an adult.

For Burns...

Minor burns are called first degree burns and involve only the top layer of the skin. The skin is red and dry and the burn is painful. More serious burns are called second or third degree burns. These burns involve the top and lower layers of skin. Second degree burns cause blisters, redness, swelling, and pain. Third degree burns are the most serious. The skin is gray or white and looks burned. All burns need immediate first aid.

Minor Burns

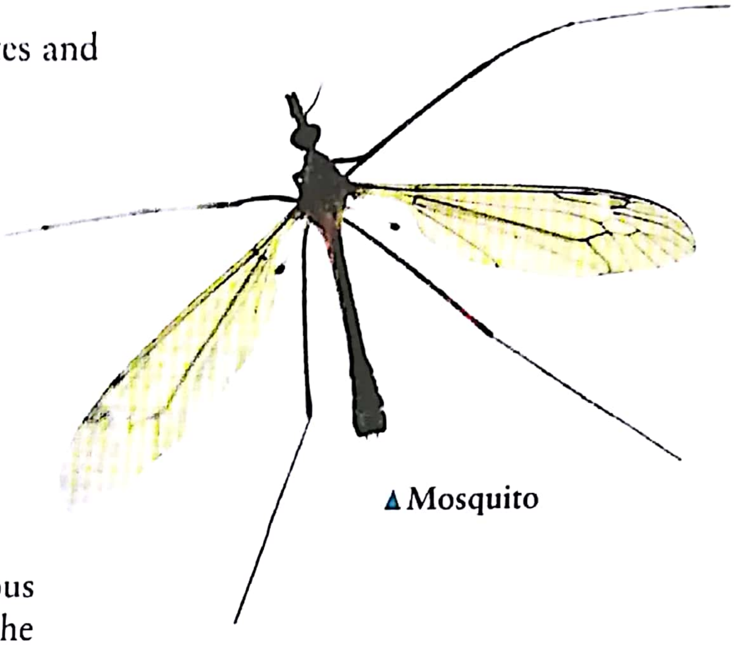
- Run cool water over the burn or soak it in cool water for at least five minutes.
- Cover the burn with a clean, dry bandage.
- Do not put lotion or ointment on the burn.

More Serious Burns

- Cover the burn with a cool, wet bandage or cloth. Do not break any blisters.
- Do not put lotion or ointment on the burn.
- Get help from an adult right away.

For Insect Bites and Stings...

- Always tell an adult about bites and stings.
- Scrape out the stinger with your fingernail.
- Wash the area with soap and water.
- Ice cubes will usually take away the pain from insect bites. And paste made from baking soda and water also helps.
- If the bite or sting is more serious and is on the arm or leg, keep the arm or leg dangling down. Apply a cold, wet cloth. Get help immediately!

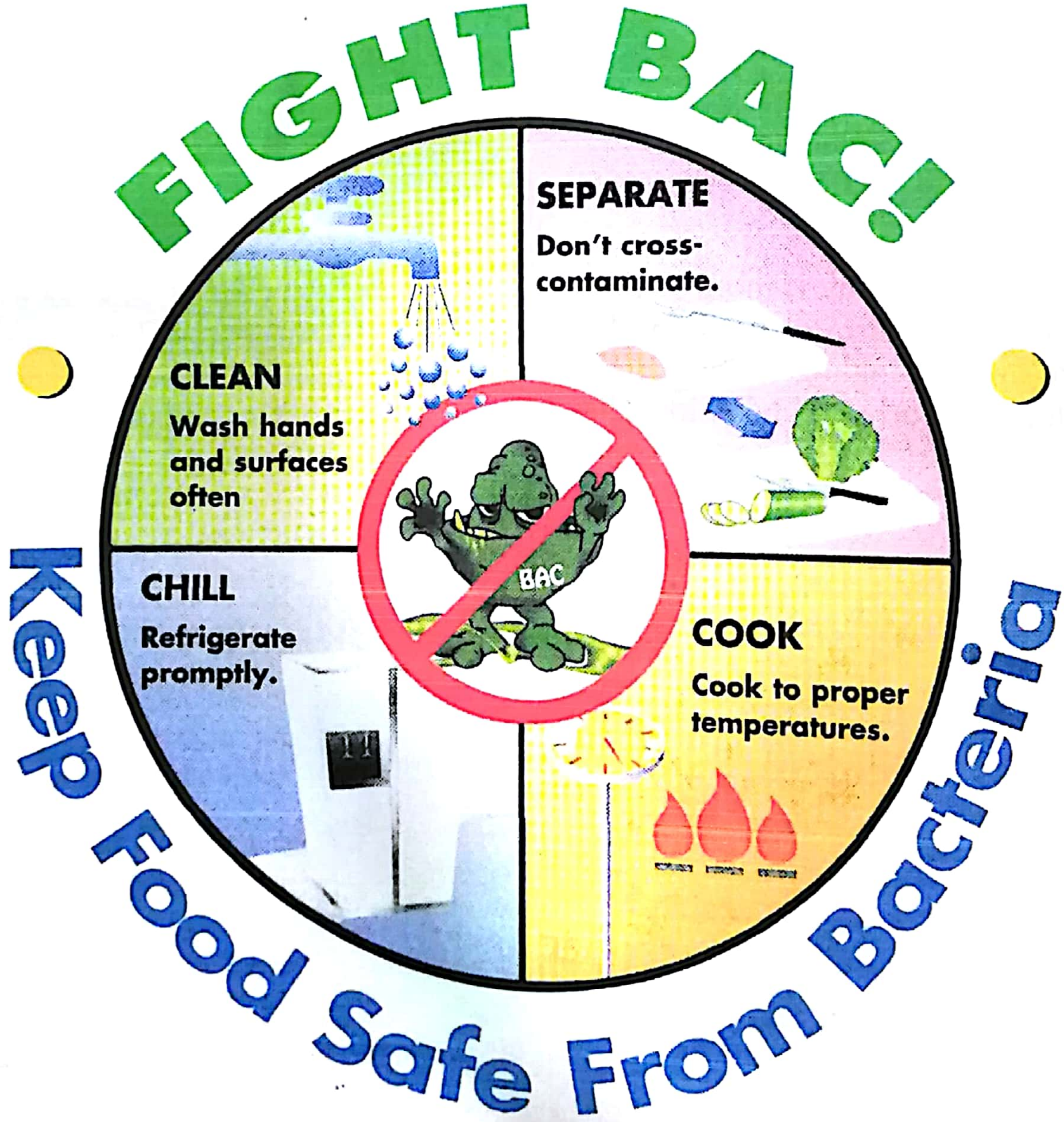


▲Mosquito

Preparing Foods Safely

Fight Bacteria

You probably know to throw away food that smells bad or looks moldy. But food doesn't have to look or smell bad to make you ill. To keep your food safe and yourself from becoming ill, follow the steps outlined in the picture below. And remember—when in doubt, throw it out!


FIGHT BAC!
SEPARATE
Don't cross-contaminate.
CLEAN
Wash hands and surfaces often
CHILL
Refrigerate promptly.
COOK
Cook to proper temperatures.
BAC
Keep Food Safe From Bacteria

Food Safety Tips

Tips for Preparing Food ...

- Wash hands in warm, soapy water before preparing food. It's also a good idea to wash hands after preparing each dish.
- Defrost meat in the microwave or the refrigerator.
- Keep raw meat, poultry, fish, and their juices away from other food.
- Wash cutting boards, knives, and countertops immediately after cutting up meat, poultry, or fish.

Tips for Cooking Food ...

- Cook all food completely, especially meat. Complete cooking kills the bacteria that can make you ill.
- Red meats should be cooked to a temperature of 71°C. Poultry should be cooked to a temperature of 80°C.When done, fish flakes easily with a fork.
- Never eat food that contains raw eggs or raw egg yolks, including cookie dough.

Tips for Cleaning up the kitchen ...

- Wash all dishes, utensils, and countertops with hot, soapy water. Use a soap that kills bacteria, if possible.
- Store leftovers in small containers that will cool quickly in the refrigerator. Don't leave leftovers on the counter to cool.

Glossary

A

amphibian An animal that begins life in the water and moves onto land as an adult **(30)**

B

bird An animal that has feathers, two legs, and wings **(25)**

C

carnivore An animal that eats other animals (70)

condensation The process of a gas changing to a liquid **(116)**

conduction The movement of heat from one object to another when they touch **(176)**

conductor A material in which heat moves easily **(177)**

constellation A group of stars gathered closely together forming a distinctive shape **(128)**

consumer A living thing that eats other living things as food **(69)**

core The center of the Earth **(90)**

crust The solid outside layer of the Earth **(90)**

D

decomposer A living thing that breaks down dead organisms for food **(70)**

deciduous trees Trees whose leaves fall in autumn **(50)**

desert An ecosystem where there is very little rain **(42)**

E

energy pyramid A diagram that shows that the amount of useable energy in an ecosystem is less for each higher animal in the food chain **(76)**

environment Where everything both living and nonliving surrounds a living thing. **(42)**

evergreen trees the trees that do not lose all their leaves at the same time **(50)**

evaporation The process by which a liquid changes into a gas **(116)**

F

fins Body parts of fish that help them move in the water in different directions **(32)**

fish An animal that lives its whole life in water and breathes with gills **(32)**

food chain The path of food from one living thing to another **(74)**

float To stay on the surface of a liquid **(154)**

force A push or a pull **(186)**

fresh water Water that has very little salt in it **(56)**

friction A force that slows down or stops moving objects **(190)**

G

germinate When a new plant breaks out of the seed **(16)**

gills Body parts found in fish and young amphibians that take in oxygen from the water **(31)**

gravity The force that pulls objects towards the Earth **(189)**

groundwater A form of fresh water that is found under Earth's surface **(108)**

H

heat Something that makes objects hot **(170)**

herbivore An animal that eats plants **(69)**

I

igneous rock A rock that was once melted rock but has cooled and hardened **(94)**

inclined plane A flat surface set at an angle to another surface **(195)**

insulator A material through which heat does not move easily **(178)**

interact When animals and plants affect one another or the environment to meet their needs **(68)**

L

lever A bar that moves on or around a fixed point **(194)**

lunar eclipse The hiding of the moon when it passes through the Earth's shadow **(136)**

M

mammal An animal that has fur or hair and is fed milk from its mother's body **(22)**

mantle The middle layer of the Earth **(90)**

mass The amount of matter in an object **(152)**

matter Anything that takes up space **(148)**

metamorphic rock Igneous or sedimentary or other metamorphic rock that has been changed by heat and pressure **(94)**

mineral An object that is solid, is formed in nature, and has never been alive **(88)**

mixture A substance that contains two or more different types of matter **(159)**

moon a large, rocky object that orbits a planet **(126)**

moon phases The different shapes the moon seems to have in the sky when observed from Earth **(134)**

motion A change in position **(187)**

O

omnivore An animal that eats both plants and other animals **(70)**

orbit The path an object takes as it moves around another object in space **(126)**

P

permanent snow line The line above which snow remains all year round **(48)**

pistil The female part of the flower **(18)**

planet A large body of rock or gas that orbits the sun **(126)**

precipitation The water that falls to Earth as rain, snow, sleet, or hail **(117)**

producer A living thing that makes its own food **(69)**

pulley A simple machine made of a rope or chain that goes over a wheel **(196)**

R

reptile A land animal that has dry skin covered by scales **(33)**

rock A solid made of minerals **(90)**

rock cycle The process in which one type of rock changes into another type of rock **(95)**

S

salt water Water that has a lot of salt in it **(56)**

scales The hard, thin, or thick plates that help protect the bodies of fish and reptiles **(32, 33)**

sedimentary rock A rock formed from material that has settled into layers and been squeezed until it hardened into rock **(94)**

seed The first stage in the growth of many plants that have roots, stems, and leaves **(15)**

seedling A young plant that comes out of a seed **(16)**

simple machine A tool that helps people move objects easily **(194)**

simple plants Plants that have no roots, stems, or leaves **(14)**

sink To go down below the surface of a liquid **(154)**

solar eclipse The hiding of the sun that occurs when the moon passes between the sun and Earth **(136)**

solar system The sun and the objects that orbit around it **(126)**

solution A mixture in which the particles of two different kinds of matter mix together evenly **(160)**

speed The measure of how fast something moves over a certain distance **(188)**

stamen The male part of the flower **(18)**

star A huge ball of burning gases **(128)**

T

temperature The measure of how hot or cold something is **(172)**

thermometer A tool used to measure how hot or cold an object is **(172)**

V

volume The amount of space that matter takes up **(153)**

W

water cycle The movement of water from Earth's surface into the air and back to the surface again **(116)**

wedge A simple machine formed of two attached inclined planes **(195)**